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The Chemical Age

VOL. LXVII 6 DECEMBER 1952 No 1743

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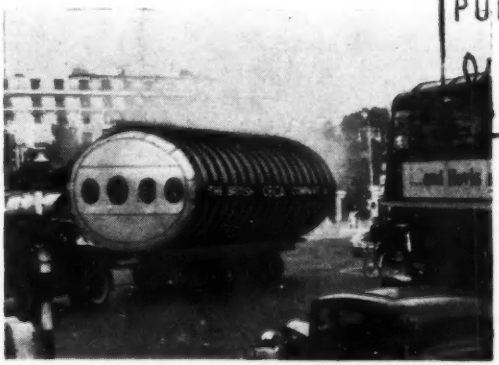

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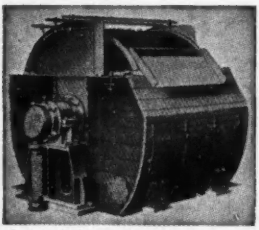

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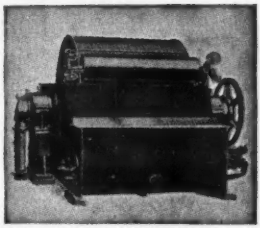

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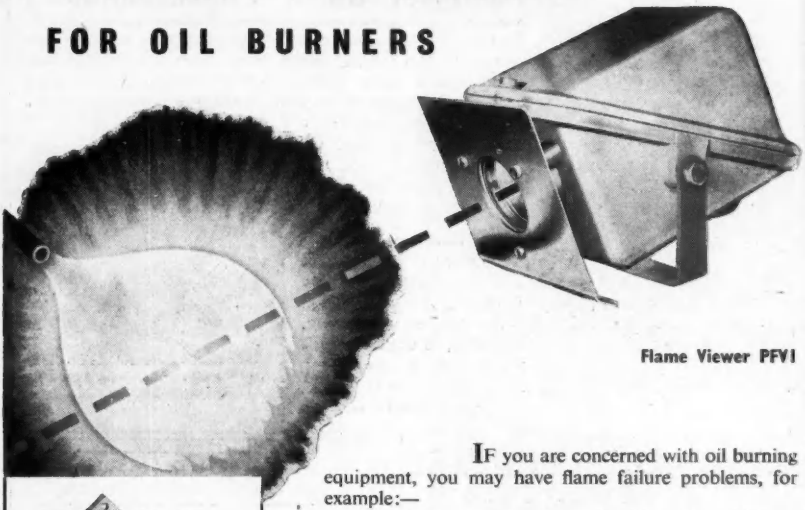

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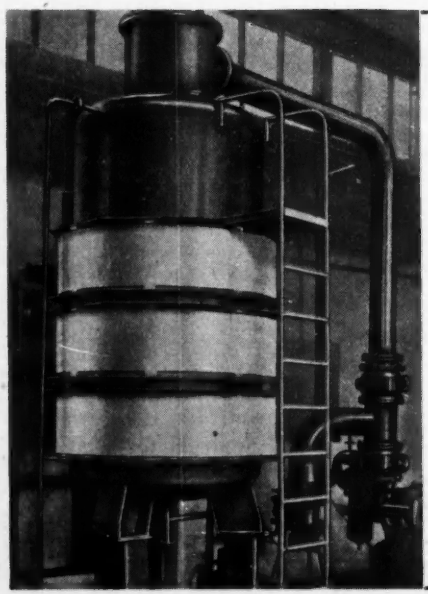

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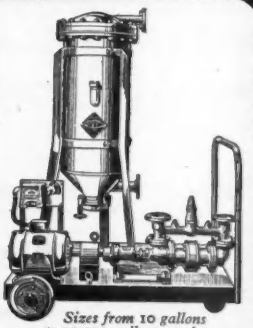

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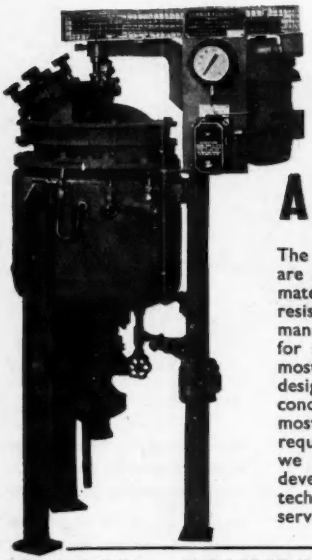

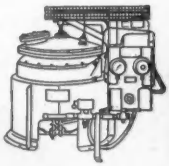

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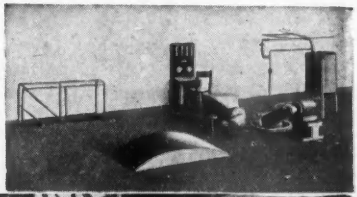

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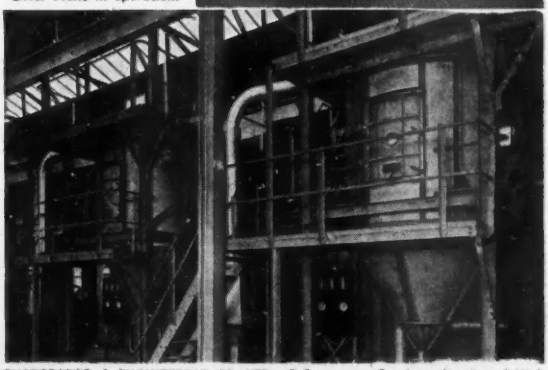

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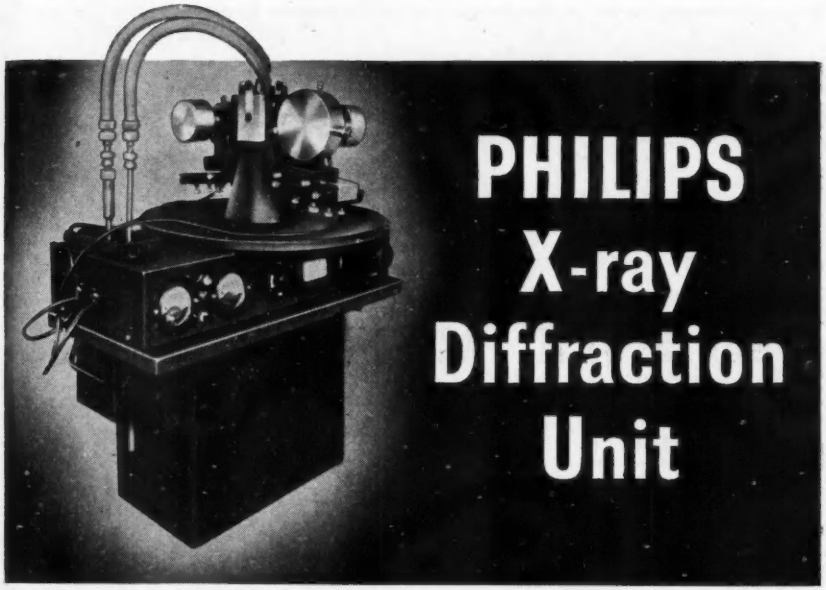

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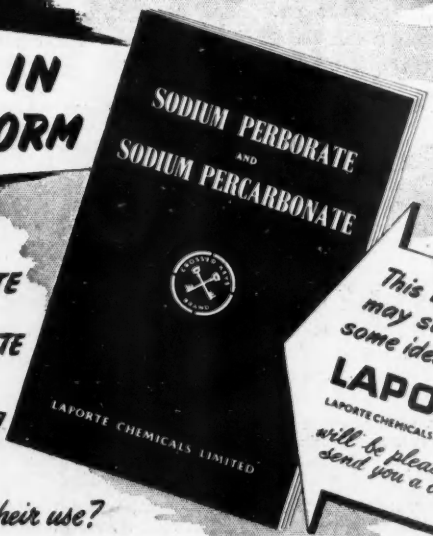

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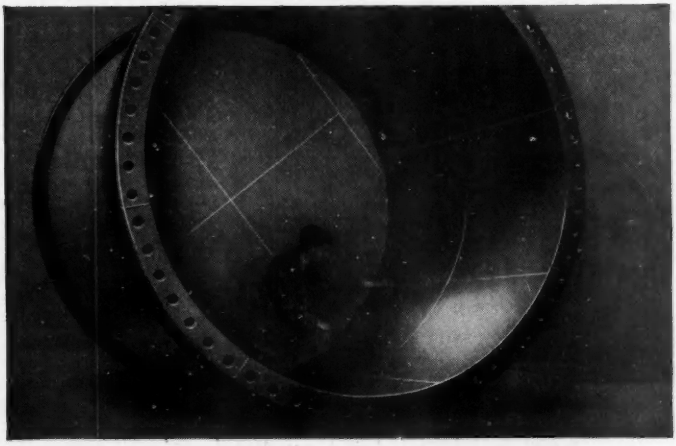

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Volume LXVII 6 December 1952 Number 1743

Atomic Power Prospects

THE explosion of a British atomic weapon in the Montebello Islands on 3 October showed that in a comparatively few years our unaided efforts in nuclear research have reached a major point of practical achievement. It is certainly possible to deplore the fact that military utilisation of nuclear fission has taken precedence over peaceful utilisation, but a country whose small size and strategic situation make it one of the most vulnerable of all targets for atomic bombs or missiles would be inviting political if not physical extinction by refusing or hesitating to develop atomic weapons of its own. If the Montebello weapon is a technical achievement, it is also an economic achievement. When what is already publicly known about the production of the first U.S. bombs is considered, this country during her severe post-war strůggles has done remarkably well to become an atomic power in her own right by 1952. We do not know how much has been spent—such matters remain secret—but we can safely assume that the cost has been much less than that of the first U.S. development.

Success in the politico-military field of atomic fission inevitably raises the question of success in the more peaceful field of industrial power. Priority or urgency alone has not produced weapons first. For better or worse it has been easier to unleash atomic energy in a single and violent burst than to release it gently and steadily as controlled power. In the United States, owing to the start of several years enjoyed by their scientists, a nuclear-powered submarine has been developed, and a low-power breeder reactor has produced power for a hundred or so electric fires and some lamps, but these are not huge advances. It is probably correct to say that Harwell's use of waste heat from an atomic pile for establishment heating was the first such development. There is clearly an inherent slowness in the pacific development of atomic energy. It is hardly surprising. Explosions had been used for their destructive power for many generations before they could be harnessed as controlled driving power in the internal combustion engine.

Nevertheless, the prospects of atomic power being eventually developed are not dim. Two contributions appearing in the current number of *Atomic Scientists' News* (1952, **2**, 2, 98-106)—one by Sir Claude Gibb and the other by Sir John Cockcroft—give an encouraging and lucid picture of the British position. Both writers deflate the idea of cheap power

from atomic fission. It is as a new source of power, an additional source, that the future virtue of nuclear energy will be assessed. Our power requirements are steadily rising and Sir Claude Gibb and Sir John Cockcroft are not alone in their fears that coal or oil or even water power will not keep pace with future demands. 'It is of much greater importance to industry that it has more electricity than it has cheaper electricity' (Sir Claude Gibb).

Uranium is a costly fuel, but it is being unearthed in an increasing number of places in the world. The discovery of uranium sources in Canada and Australia is of immense importance to the Commonwealth. Sir Claude Gibb urges greater attention to surveying Commonwealth territory for uranium ores and to reducing the present costs of ore-refining methods. Here perhaps military priorities have so far tended to impede industrial development. Atomic weapon projects, whether successful or not yet successful, have obviously enlarged demands for uranium and created most of the inflationary 'uranium boom'; however, without this pressing inducement, the several new uranium deposits would probably not have been found. If ultimately atomic weapons are prohibited by world agreement—unlikely enough today but stalemates bring their own compulsions—the uranium supply situation will be a most valuable legacy for peaceful nuclear developments. The utilisation of uranium as a power fuel is gravely handicapped by the fact that only about 0.7 per cent of it—uranium 235—is useful, U238 being useless by itself. This basic problem is already theoretically solved by the idea of the power breeder pile, which converts the uranium 238 into the 235 form or into plutonium, also fuel-suitable, while simultaneously using up existent uranium 235 as fuel. A central core of 235 will produce heat for power while a surrounding blanket of 238 is being converted. Such a unit may indeed accumulate fuel, producing more in its outer blanket than the active core is losing by 'combustion'.

It is not a superficial generalisation to say that the next phase of development depends more upon chemical engineers and chemists than upon atomic scientists. Methods of separating new fuel from the cores of breeder reactors must be developed. The heat transfer must be accomplished using liquid metals—sodium is suggested—and all the concomitant engineering problems of fused liquid metal circulation must be investigated and solved. According to Sir John 'the cost of electricity derived from nuclear energy will depend almost entirely on the cost of chemical processing. . . .' It is a challenge that is national in a non-aggressive sense. The first country to develop practical means for producing power from nuclear energy will not benefit merely from the additional power source but from the prestige of being first and the opportunity of remaining ahead.

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Notes & Comments

Specialised Uses for Tantalum

TANTALUM—which incidentally does owe its name to the word 'tantalising' because of the difficulties Ekeberg, a Swedish chemist, encountered in trying to dissolve tantalum-containing minerals—may still be an uncommon metal but it has important specialised uses in laboratories and in chemical industry. Modern studies of tantalum have recently been reviewed in *Industrial and Engineering Chemistry* (1952, **44**, 10, 2364). Its outstanding resistance to acids and other corrosive materials has been re-investigated. Up to 150° C. the commonly handled corrosive materials of the laboratory or chemical factory do not attack tantalum at all—except fluorine, HF, fluosilicic acid, and phosphoric acid. All the fluorine materials attack at a rate of 0.05 inch per year; so, too, does fuming sulphuric acid. The rate is from 0.005 to 0.02 inch per year for phosphoric and 50-100 per cent sulphuric acids. This is a modern crossing the t's and dotting the i's of the old generalisation that tantalum resisted all corrosives except hydrofluoric acid.

Properties Investigated

ANOTHER modern investigation on this metal has shown that all machining or welding operators with tantalum should be cold. Heating tantalum does not increase its ductibility and because the metal has such a high capacity for absorbing gases—a property that gives rise to its use in vacuum tubes—heat treatment may in fact make it more brittle. High-speed steel tools must be used for machining tantalum—non-ferrous alloys or tungsten carbide tools fail because of tantalum's tendency to weld with non-ferrous metals or form carbides. Until recently most of the work on tantalum alloys has been in the field of ferrous alloys where there has been a useful amount of practical development; but this latest review reports studies of binary alloys with chromium, molybdenum, titanium, and boron. Judging from the last three volumes of *Reports on the Progress of Applied Chemistry* scientific interest in tantalum is now almost an American monopoly. However, it has long been one of the policies of U.S. research to investigate the properties of rarer metals and less common chemicals, developing production more cheaply if possible whenever prospects of wider use seem indicated.

Gold Coast Aluminium?

THE White Paper on the Volta River Aluminium Scheme is an exceptionally impressive document. A hydroelectric power station at Ajena involving a 2,000-square-mile reservoir, an aluminium smelter twelve miles distant at Kpong, and extensive public works including the creation of a new port at Tema some thirty miles from the smelter, are the principal parts of the project and they will initially cost £100,500,000 and ultimately £144,000,000. Of the initial capital requirement the British Government is prepared to find £43,300,000, the aluminium industry £20,900,000, with the remainder—£36,300,000—to be drawn from the Gold Coast Government and private investment. The commencing capacity of the smelting works will be 80,000 tons of aluminium per annum but with steadily rising capital outlay the tonnage will rise (in about 20 years) to 210,000 tons.

Prospects Attractive

WHEN it is considered that the huge and important Canadian aluminium industry has been founded entirely upon imported bauxite, the prospects of the Gold Coast scheme seem attractive indeed, for at Mpraeso and Yenahin respectively, about 60 and 150 miles from Kpong, there are bauxite deposits estimated at more than 200,000,000 tons, enough to cover 200 years maximum aluminium output from the smelter. There is ample evidence that the world demand for aluminium will steadily increase. For example, it is estimated that Britain alone will require by 1975 three times as much aluminium

as the 316,000 tons consumed in 1951. The Paley Commission in the U.S. has predicted even higher rates of increase, setting world demand in 1975 at from four to five times the 1950 demand. In return for British investment, the smelting company will be obliged to offer to U.K. buyers not less than 75 per cent of production during the first 30 years at f.o.b. Gold Coast port, prices not exceeding the sterling equivalent of the North American or Canadian domestic prices f.o.b. refinery. However, there is adequate cover for abnormal contingencies that might make these ceiling prices uneconomic to the company.

To Britain's Advantage

A STERLING source of aluminium will be of immense advantage to Britain. Over 70 per cent of world production is in the dollar area, shared between Canada and the U.S.A.; 10 per cent or more is in Russia; the small remainder is scattered in small amounts in other countries, e.g., our own Scottish output, the French and Italian industries, etc. Taking 1948, a pre-Korean post-war year, Britain consumed 174,000 tons of primary (virgin) aluminium and of this only 30,000 tons were home-produced; thus, rather more than 80 per cent had to be imported and almost the whole of this amount was dollar-imported from Canada. As for production since 1948, it is noteworthy that European output had almost doubled by 1951 while U.K. output had fallen by 10 per cent. Considered against this background the proposed Gold Coast aluminium industry has inestimable merit. Before final decisions are taken a Preparatory Commission is to be set up 'under instructions to report with all practicable speed.' Other colonial development projects with much less promise have been embarked upon without this degree of caution !

New Soluble Nylon

I.C.I. are now producing, in development quantities, a polymer known as 'Nylon Soluble Polymer Type CA,' which is soluble in alcohol/water mixtures. From these solutions, films and coatings can be produced which have good temperature and abrasion resistance, are tough and very permeable to water vapour. These properties fit the films for varied uses as adhesives, and as coatings for monofilaments and for textiles.

The polymer has also an important part to play as a textile finishing agent, a grade known as 'Calaton CA' having been developed for this purpose. These polymers, chemically different from those used in the production of textile fibres and monofilaments, have been available in America for some time, and a number of interesting applications have been developed.

Sir Ian Heilbron (centre) at the opening of the laboratory bearing his name at Glasgow Royal Technical College on 24 November. With Sir Ian are Sir Andrew M'Cance, chairman of the board of governors (left) and Professor F. S. Spring, Professor of Organic Chemistry. (cf. THE CHEMICAL AGE, 67, 737)

Raw Materials for Paper-Making

Address to the Royal Society of Arts

IN a paper read to the Royal Society of Arts on 26 November, Mr. G. F Underhay, director of Bowaters Development and Research, described the process by which paper is made and the outlook for future supplies of its raw materials. Mr. Kenneth Brown, president of the Newspaper Society, was in the chair. The following is an extract of the paper:—

Although paper and paper board are products which are very widely used, familiarity with the equipment for making paper and knowledge of the properties, sources of supply, and the quantities of raw materials required, is not common outside the industry. It is proposed, therefore, in addition to dealing with the main subject, to review briefly the factors governing pulp and paper manufacturing processes so that the raw material problems to be discussed may be more readily appreciated.

Quantities Consumed

In 1950, the last year for which complete figures are available, the total quantity of paper and paper board consumed in the world amounted to nearly 42,000,000 tons. By far the greater part of the raw material for this very substantial total was provided by wood, the quantity of all varieties of wood pulp produced (excluding a considerable re-use of fibre in the form of waste paper) having amounted to 30,000,000 tons. The most recently available figures indicate that consumption is continuing to increase and, at current levels, it has reached the highest figures yet recorded.

Almost any kind of tree or plant can be used for paper-making, but although the possible range of varieties is enormous, in practice the choice is narrowed down to a relatively few types selected because of their availability, the quality of the fibre that can be made from them, and the cost of producing a suitable pulp.

Pulping processes, by which fibres may be isolated from naturally occurring material and brought to a suitable state of purity and degree of fibre separation, consist either of chemical treatment, mechanical treatment, or a combination of both. Processes which have been practised successfully for many years include grinding wood by pressing 3-ft. or 4-ft. lengths against a revolving grindstone; alkaline cooking (usually under pressure) of various materials including woods, cereal straws, grasses and rags, using caustic soda alone or caustic soda and sodium sulphide, and acid cooking, under pressure, using calcium bisulphite solution for the digestion of non-resinous soft wood.

Mechanical Grinding

In mechanical grinding, an extensively used process suitable only for wood, the groundwood pulp produced is obtained by the purely physical process of tearing the fibres from the log; with quantities of water being showered on the grindstone; practically all the original constituents of the wood remain with the pulp. In chemical processes, however, the aim is to dissolve out most of the non-cellulosic material, thus freeing the fibres from the cementing substances (chiefly lignin) and isolating them as a fibrous pulpy mass composed of true cellulose and some related compounds. Newer processes, mostly developed for special purposes, involve the use of neutral sodium (particularly suitable for hardwoods and straw), the production of high yields by refining hot partially cooked wood chips, and multi-stage digestion in which preliminary alkali treatment is followed by chlorination, further alkali treatment, and multi-stage bleaching. The colour of most pulps can, where necessary, be improved by some form of bleaching treatment.

The fibres present in plant life all have typical length and other characteristics which vary with the species. The more common type of paper-making fibres range from a length which may be as short as 1 mm. or less, for hardwoods, esparto grass and cereal straws, through the medium lengths which include spruce and pine fibres (length up to about 5 mm.) to the long fibred materials, examples of which are cotton (up to 4 or 5 cm.) and flax (up to 6 cm.). Variations not only in the length but in the width, wall thickness, fibre structure, and physico-chemical properties are of great importance to the paper-maker, and all these factors, as well as the overriding one of cost, are care-

fully considered in selecting the fibre best suited to the quality of paper to be made.

In times of paper shortage, such as have been experienced after each of the world wars, when raw materials appear to be very scarce, dozens of possible alternatives are pressed on the paper industry for their urgent consideration. Examples of these, available in this country, are fruit tree prunings, hop bines, the common nettle, and sawdust. It is possible to make paper from all of these and hosts of other materials, including even grass mowings from the lawn, but even if the fibre quality is good (the common nettle, for instance, has an outstandingly good fibre), collection and transport costs are almost invariably far too high and the yields obtainable are often low. In spite of these well-known facts, however, proposals for using materials of this kind are put before the paper industry with great regularity.

Cellulose Fibre Characteristics

Cellulose fibres have several characteristics in common, which are very important from the paper-making point of view. In addition to having good strength as individual units, adequate length and flexibility, and a degree of resistance to chemical attack important for digestion processes and for paper permanence, fibres are endowed with an ability to stick to one another by virtue of the nature of the cellulose and the small quantities of closely related substances, including particularly the hemicelluloses, which go into the composition of the fibre. During the present century there has been much speculation and study in connection with the forces that are responsible for this cohesive ability, and a brilliant chapter of investigation in this field, revealing the structure and properties of cellulose, has enabled the conclusion to be drawn that it is a type of linkage, on the border line between physical and chemical forces and now well known as hydrogen bonding, which, operating through the presence of the hydroxyl groups occurring regularly in the ultimate cellulose chain, enables fibres, under suitable conditions, to stick strongly enough to one another to produce paper.

How far the hydrogen bonding can be made available to the paper-maker for building up strength in his sheet depends on the construction or morphology of the fibres, the degree of crystallinity of the cellulose, the amount and the nature of the near-cellulose and other constituents present, and the extent to which mechanical beating can be used to bruise and fray the fibres so that areas of contact between fibre and fibre, when made up into a sheet of paper, may be increased.

It is interesting to note, incidentally, that fibrous materials which do not have all the attributes of cellulose can be made into paper; special treatment has to be given, however, to offset the defects. Asbestos, for instance, of which considerable quantities of paper are manufactured, is composed of mineral fibres having no natural mechanism that can be used to enable them to stick to one another. In consequence, an adhesive has to be added, usually in the form of an organic binder such as starch, to bind the fibres well enough together to form a sheet sufficiently strong for the purpose. The extra difficulties involved in making paper from materials of this kind are justified, of course, only because of special properties in some other direction; asbestos paper, as is well known, is used extensively for fire resistance purposes.

Complex Equipment

From the point where the chosen vegetable fibre has been isolated in a suitably pulped condition, to the manufacture from it of paper of the desired quality, there is the paper-making process proper which, for modern continuous production, necessitates complex and costly equipment. In this country, a high-speed machine of the most advanced type and capacity, as used for producing newsprint at a rate of some ten tons per hour, costs nearly £500,000, exclusive of buildings and the multiplicity of pumps, chests, piping and stock-treating equipment that is required. Over 3,000 h.p. is required to operate such a machine and 25 tons per hour of low-pressure steam are needed for drying the paper. Right at the opposite end of the scale, paper can be made by hand on hand moulds and, to satisfy the demand for very high-quality rag writing and document papers, the one or two hand-made mills still existing in this country continue to produce very attractive products both for the home and overseas markets.

The essence of the method of making paper by hand, involving as it does the filtering on a fine wire of a suspension of stock in water, remains as the essential basis of

paper-making processes to-day whether the machines are large or small. The discontinuous and extremely slow hand operation, however, has been almost entirely displaced by continuous production methods.

A dilute suspension of well mixed and properly treated stock of a concentration around 0.5 per cent is poured, evenly and continuously, from a very shallow rectangular orifice, called the slice, directly on to an endless wire. The issuing stock has the appearance of a liquid ribbon half an inch thick and covering nearly the full width of the wire. Travelling immediately below the slice and at about the same speed as the issuing stock, the wire is supported horizontally on rollers.

Drainage of water through the wire starts immediately the stock flows on to it, and, aided in the later stages by vacuum applied to the underside, the fibres, most of which remain screened out on the top of the wire, gradually become formed into a felted and very immature mass of paper. In this process the original 0.5 per cent stock becomes concentrated up to an exceedingly wet sheet containing about 20 per cent of fibre and 80 per cent of water at the far (couch) end of the wire. Here the wire returns to the slice, and the sheet, though extremely fragile, has to be picked off, transferred without breaking on to absorbent felts, and passed on them through two or three heavy presses where further water is removed by squeezing, thereby consolidating the fibres into a denser and somewhat stronger web.

Moisture Content Reduced

The moisture content will now have been reduced about as far as is possible by the draining and pressing processes, and the sheet will contain some 35 per cent of solid material and 65 per cent of water. Beyond this point, removal of water has to be accomplished by evaporation, the usual procedure being to pass the paper over a series of steam-heated cylinders followed by calendering. Paper usually has a moisture content of around 8 per cent.

This much abbreviated description of how paper is made will serve to introduce the important point that fibrous raw material chosen for any particular purpose must have properties which are suitable not only for the quality of paper wanted but also for the process by which the paper is made. In the continuous process, the stock on the wire must not hold on too tenaciously to the water in which it is suspended, otherwise the draining, pressing and drying operations will be hindered. On the other hand, it is necessary, by appropriate mechanical beating and refining treatment, to bruise, fibrillate, and perhaps shorten the fibres to the extent demanded by the quality of paper aimed at. These treatments inevitably make water removal more difficult and machines that have to make paper from heavily beaten fibres have to be given more time for the water to get away, and they usually have to operate more slowly.

Different Appearance

After heavy beating the fibres take on a very different appearance. They are split and frayed and part with water very much less readily. Paper made from such a heavily beaten stock will be relatively dense and very strong.

In addition to controlling the mechanical treatment of pulps to give required characteristics, the paper-maker is very alive to the fact that fibres from different kinds of raw materials differ very much from one another both in their initial and in their developable properties. Different methods of cooking the same raw material can also give rise to wide quality ranges. These differences have to be recognised and used to the best advantage both for the operation of the paper machine and also for the production of the required paper. Esparto grass, for many years a raw material exclusively and most successfully used in the United Kingdom, characteristically gives opaque, bulky paper of good uniformity and excellent printing qualities; pine cooked by the sulphate or kraft process (caustic soda and sodium sulphide) is particularly good for strong wrapping papers; and groundwood prints well, has excellent opacity and, being at the same time relatively inexpensive, it is used extensively for the manufacture of newsprint and magazine papers. Blotting paper is an example of a very bulky, free sheet the furnish of which usually contains mostly rag fibres that have been cut in the beater to increase water absorption.

As well as controlling quality by selecting and appropriately treating fibres, paper can be impregnated, waxed, coated, and gener-

ally treated in a variety of ways which give a tremendous range of qualities and properties. It can also be laminated to similar or dissimilar materials, and plain or corrugated boxes, fibre drums, and even constructional materials, manufactured essentially from a paper fibre base, can be produced.

Paper-making Fibre

In coming now to the most important raw material, paper-making fibre, the problem of providing adequate quantities of materials of suitable quality to satisfy world demands, at the present time and in years to come, merits careful examination.

It has already been noted that the world total usage of paper and board is over 40,000,000 tons annually. This represents an estimated consumption of 45 lb. a year per head of the population; 45 lb., however, is only the average of figures, which show great differences from country to country. The United States heads the list with a figure approaching 400 lb.; this is in striking contrast to the figure for the continent of Asia where the consumption is only 2 or 3 lb. per person. In Northern Europe the figure is around 115 lb., and in the United Kingdom, it is about 160 lb. Thus, if the high consumption figures per head of the population per year for the most advanced countries are to be followed in due course by those areas of the world where education and modern standards of living have either not begun to operate or have not yet had their full impact, then indeed the world demand for paper and, therefore, for the raw materials to make it, will be very great indeed.

In the history of paper-making there have been many scares about the availability of raw materials. A few of the scares have been real, but only so far as the particular raw materials in use at the time were concerned; most of them have been false.

Shortages such as we have just experienced are due not to lack of the primary raw materials but to a variety of other causes including serious slowing down of the normal expansion rate of mills during the war years; a demand which is high in relation to productive capacity and stocks; and, to some extent, to a temporarily reduced level of immediately available raw materials due to abnormal cutting of timber in countries isolated by the war from their normal raw material supplies. Under these circumstances prices soar, all too often completely out of step with costs, and would-be exploiters of a great variety of both ordinary and extraordinary alternative raw materials endeavour to turn the situation to their advantage by talking of a decline in wood supplies and showing how well the costs of their alternative raw material compare with the ruling prices (not, however, the costs) of conventional pulps. Pulp and paper mills use heavy equipment, the capital cost of which is high in relation to the value of the product. To meet increases in demand, particularly during the years immediately following a war, a period of several years may be needed, and thus it takes time to satisfy market requirements. During this period, worried converters and sellers endeavour to build up greater stocks than they normally carry, and these factors further exaggerate the gravity of shortage conditions.

All the indications at present are that now, and probably for many years to come, ample wood supplies (supplemented to a small extent in various parts of the world by indigeneous raw materials that have been found to be profitable for local use) will be available to meet both the existing and future needs of the paper industries of the world. Indeed, it seems likely that wood will retain its place, perhaps indefinitely, as the most important raw material for paper-making both because of its inherent suitability and also because, for the majority of countries, wood pulp can be made available at an economic price. If complications should arise they may perhaps come because of competition from other interests such as the timber and the rayon industries.

New Methods Adopted

These views are based both on the history of wood usage and also on the trend evident in recent developments. Wood varieties that have ceased to be accessible because of too heavy cutting have been replaced by developing new methods of using trees formerly thought unsuitable for pulping; yields have been increased, sometimes spectacularly, by improved digestion processes; saw and pulp mills are being integrated to the advantage of both; great attention is being paid to the need for operating on a sustained yield basis; and forest management is being improved, resulting in controlled cutting and substantial reductions in losses due to fire and pest.

Dr. Weizmann's Contribution to the British Chemical Industry

By E. SHAMASH, B.Sc., F.R.I.C., Director, Leda Chemicals, Ltd.

DR. CHAIM WEIZMANN was born in Czarist Russia in 1874 and as a boy he worked in a small chemical factory. He studied chemistry at Berlin and later at Geneva, and gained his Doctorate with a brilliant piece of dyestuff research which gained him the top rating of his year. He later became lecturer in chemistry at the Geneva University, and although happy there, his great desire was to study further in England from whence the fame of Professor W. H. Perkin of Manchester University had already reached him.

He accordingly left Switzerland, not without some misgivings, as he was without money or friends in England, and arrived in Manchester bearing a letter of introduction from Professor Graebe of Geneva to Professor Perkin.

He was made very welcome by Professor Perkin and was allowed the use of a laboratory in the chemical school. This laboratory was in a dingy basement, and Tom Edwards (the Chief Steward of laboratories) gave him the reassuring news that all his predecessors had finished up with rheumatism! He soon realised that Tom was the most important person in the place as the custodian of the fine chemicals store, and has recorded how he found Tom a kind man with a peculiar talent for playing football with pieces of glassware without ever smashing them.

Anthracene Synthesis

Impressed with his work, Professor Perkin placed at his disposal a team of research workers, and after a short time Weizman established the reaction between Grignard reagents and phthalic anhydride as a fundamental step in the synthesis of anthracene derivatives. This method was used 30 years later by Professor Fieser of Harvard in his reseach on the relation between carcinogenic properties and molecular structure.

Money was running short, however, and Weizmann was approached by Charles Dreyfus, then a director of Clayton Aniline, who offered him a part-time research post, which Professor Perkin gave him permission to accept. Professor Perkin also helped by allowing him to lecture at the University.

These improved financial circumstances enabled him to pay a return visit to the Continent, where his financée Vera Chatzmann, to whom he had become engaged while lecturing in Geneva, had by now graduated. He married her and took her back with him to live in lodgings in Manchester.

Friend of Lord Rutherford

Weizmann got on very well with his colleagues at the University and numbered among his friends Lord Rutherford, whom he found 'boisterous and good natured.' Another close friend was Albert Einstein. Weizmann comments that as an experimenter Rutherford was a genius; in contrast Einstein achieved all his results by sheer calculation. During this period Weizmann published a considerable number of papers and obtained his D.Sc. He always had a very deep affection for Manchester and after a while he and his wife became naturalised British subjects.

In 1911 the consumption of natural rubber was rapidly increasing and rising prices created a great demand for a synthetic material. In trying to make isoprene Weizmann carried out experimental fermentations with the aim of preparing *iso*amyl alcohol. He found, however, that butanol and acetone were the only products obtained. This led him to investigate butadiene, which could be prepared from butanol, and he discovered that a rubber-like material could be obtained using metallic sodium as a catalyst. However, the price of natural rubber very soon fell and the process was dropped until the Germans took it up and developed it into the preparation of 'Buna' (*Bu*tadiene *Na*). This work, however, paved the way to his greatest contribution to his adopted country.

In August 1914 he communicated his discovery of the manufacture of acetone by fermentation to the War Office. By March 1916 the Admiralty were suffering from a

very serious shortage of this solvent for the enormous quantities of cordite being manufactured. Weizmann was called in to see Winston Churchill, whose first words were 'Well, Dr. Weizmann, we need 30.000 tons of acetone. Can you make it?' Dr. Weizmann's answer was that the largest quantity he had prepared was 500 cc.!! He was, however, hopeful that the process would work on the large scale. Weizmann thereupon joined the Admiralty and developed his process until he had worked out a method of large-scale production which proved completely successful. He trained many young chemists in this new technique and sent them out to various English and Scottish distilleries to convert them to acetone production.

Other Raw Materials Used

As the U-boat campaign had by then reached its height it was found difficult to obtain the hundreds of thousands of tons of maize required, and Weizmann adapted the process to use a mixture of maize and chestnuts. In India rice was used as the raw material. The major production was, however, undertaken in Canada and the U.S.A., and huge quantities of acetone were produced and the cordite problem was solved.

Weizmann had by now moved to London and at the outbreak of the second World War he became Honorary Chemical Adviser to the Ministry of Supply. He was given a laboratory near Hyde Park and was put in charge of a group of chemists. This laboratory had a large number of glass windows, and chemists were consequently advised to shelter during air-raids. Fortunately for them all they decided to go on working during one raid in which their local air-raid shelter sustained a direct hit, and was completely destroyed with much loss of life.

Dr. Weizmann continued his research work on the production of butadiene which was now of the utmost importance owing to the loss of Malaya to the Japanese, and this led to the large-scale production of synthetic rubber mainly in the U.S.A., which played a vital part in keeping the Allies supplied with this essential material. Later in the War Weizmann was appointed to a British Commission to West Africa in the company of Walter Elliot and Creech Jones. He outlined an unorthodox and important long-term plan for the industrial development of the British Commonwealth based on fermentation industries, which could be established in countries like West Africa, where root starches are grown in abundance. Such factories could produce enormous quantities of ethanol, butanol, and acetone, which could make the Empire virtually independent of oil as a source of fuel and power. Also at this time high octane fuel had became scarce owing to the colossal development of the R.A.F., and Weizmann did some very useful work in the production of aviation fuels by the use of ketones.

His two sons served in the Forces during the war, and his younger son Michael was killed in the R.A.F. in 1942.

While in Manchester Weizmann had become the close friend of C. P. Scott, then editor of the *Manchester Guardian*, and he also met Lord Balfour who at that time represented the Clayton Division of Manchester. The support of such men was a major factor in the Balfour Declaration, which announced in 1917 that Great Britain favoured the establishment of a National Home for the Jewish People in Palestine.

In 1918 he was sent to Palestine by H.M. Government as Chairman of a Zionist Committee, and in July of that year in the company of General Allenby, the hero of Jerusalem, he laid the foundation stone of the Hebrew University just outside that City. He also established a Technical College at Haifa and an Agricultural Research Station at Rehovoth, which has since developed into the Weizmann Institute of Science. Dr. Weizmann personally selected many of the technical personnel, among whom was Dr. E. D. Bergmann with whom he collaborated on some valuable work on the aromatisation of crude oil by a catalytic cracking process, which has since been successfully developed into a chemical process by the Manchester Oil Refinery for the preparation of benzene, toluene, and naphthalene derivatives. He also directed some original work on the breakdown of proteins, which has developed into an industry of considerable nutritional importance.

Choice Unanimous

When the time came in 1948 for electing Israel's first President, Dr. Weizmann was the unanimous choice.

Mr. Churchill said of him at the last Lord Mayor's banquet 'Those of us who have been Zionists since the days of the

Balfour Declaration 35 years ago, know what a heavy loss Israel has sustained in the death of its President, Dr. Chaim Weizmann. Here was a man whose fame and fidelity were respected throughout the free world, whose son was killed fighting for us in the late war and who, it may be rightly claimed, led his people back into the Promised Land where we have seen them invincibly established as a free and Sovereign State.'

Dr. Weizmann's life was unique not only in its scientific achievement but also in its reward. It was given to him to see the fulfilment of his lifelong dream.

Sulphur from Flue Gases

Papers for Institute of Fuel Meeting

SULPHUR recovery from flue gases will be the subject of three papers to be delivered at the next meeting of the Institute of Fuel which will be held at the Royal Society of Arts, John Adam Street, London, on Wednesday, 17 December.

This problem is one of twofold interest for not only does it have a direct bearing on the health of the community but also the shortage of sulphur has made its recovery more attractive as an economic proposition.

The first paper will be given by Mr. R. Llewellyn Rees, chief chemist to the British Electricity Authority. It begins by tracing the historical development of flue-gas washing at power stations and points out that washing opposes the good effect of a tall chimney by cooling the gas. Washing may, in fact, actually increase the local pollution in certain states of weather, and it is calculated that existing gas-washing processes cost the community more than the damage done by the sulphur dioxide that they remove.

These processes are also wasteful in that no useful material is recovered from the flue gas. The use of gas liquor for manufacturing ammonium sulphate from flue gas may, however, provide a limited solution to the problem, applicable at stations which are sited so that cooling the gas is not objectionable even when the fuel is rich in sulphur.

A description is given in the second paper, by S. R. Craxford, A. Poll and W. J. S. Walker, of the Fuel Research Station, of a small plant which has been built at the station to treat 1,000 cu. ft./hr. of flue gas from a Lancashire boiler, using the ammonia process of sulphur recovery which was developed before the last war by Simon-Carves and the Metropolitan Borough of Fulham. This plant, which removes some 99 per cent of the sulphur dioxide in the flue gas, has proved entirely satisfactory in operation. Ammonium sulphate is produced from the scrubber liquor by a modification of the German Katasulf process.

In the last paper Mr. S. H. Richards describes a survey, carried out by the Fuel Research Station, of the concentration of sulphur dioxide in the air of S.W. London. The work was designed to study the effects of flue-gas washing at Fulham and Battersea power stations, on the pollution of the nearby air. Estimations of sulphur dioxide were made by the lead peroxide method.

Antibiotics & Pig Diet

Ten Per Cent Quicker Growth

ADDITION of penicillin or aureomycin to the diet of pigs has shown that it is possible to reduce by about 10 per cent the time taken to reach bacon weight and that there is also as a result an improvement of about 5 per cent in the efficiency of food conversion. This was announced in a report issued by the Agricultural Research Council on 29 November on experiments carried out under its auspices.

The Medical Research Council had been consulted and had advised that by the addition of penicillin to the diet of pigs there was no risk at all to human beings who might consume the pig meat. Another antibiotic, .terramycin was to be tried out in comparison with penicillin and aureomycin.

By the end of the year the Agricultural Research Council hoped to be able to make a positive recommendation in favour of allowing the use of aureomycin and penicillin in the diet of fattening pigs.

This was not possible at present under the Penicillin Act, which prohibited the sale to the public of preparations containing an antibiotic substance except on a medical, dental, or veterinary prescription.

Gratitude of the council was expressed to the Distillers Company (Biochemicals), Ltd., and to Glaxo Laboratories, Ltd., which supplied penicillin for the experiments; to Lederle Laboratories, Ltd., which supplied Aurofac 2A for use in the experiments; and to Pfizer, Ltd., which supplied the Terramycin Bi-Con TM5.

OCCA Conference in 1953

Papers for Technical Sessions

PROVISIONAL arrangements for its Coronation Year conference have been announced by the Oil and Colour Chemists' Associaton.

The conference will be held at Eastbourne from 2-6 June, 1953. The general title of the papers will be: 'The Optical Properties of Films of Surface Coating Materials.' There will be three technical sessions, each of three papers, on the mornings of 3, 4 and 5 June.

Programme for these sessions will, provisionally, be as follows:—

First Session—3 *June*:

(a) 'The Description of Surface Colours in Scientific Terms'—Dr. W. D. Wright.

(b) 'Some Physiological Factors in the Appreciation of Surface Colours'—Dr. E. N. Willmer.

(c) 'Optical Properties of Aesthetically Acceptable Coatings'—F. I. Rawlins.

Second Session—4 *June*:

*(a) 'The Optical Properties of Paint Films' —Miss D. L. Tilleard and Mr. T. R. Bullett.

(b) 'Some Notes on the Practical Design of Gloss Meters'—Dr. V. G. W. Harrison.

(c) 'Some Aspects of Colour Matching' —Dr. T. Vickerstaff.

Third Session—5 *June*:

(a) 'Colour Problems in Lithographic Printing'—J. H. Brittain and A. D. Lott.

(b) 'Observations on the Causes of Various Optical Effects of Pigmented Films' —Dr. R. H. Kienle.

(c) (To be arranged).

The majority of members and visitors attending the conference will be accommodated in the Grand Hotel and the overflow will be housed in the Burlington Hotel. The latter hotel has now asked the association to give its full bookings by 1 January so that it will not have to refuse requests for Coronation accommodation, should it not be required for the conference.

Members of the association have been sent a form to enable them to reserve accommodation by 1 January, 1953, but non-members can obtain such forms by application to: The general secretary, Oil and Colour Chemists' Association, Memorial Hall, Farringdon Street, London, E.C.4.

*Suggested title only.

Textiles & Chemicals

Progress & Technical Interdependence

HOW the chemical industry and the textile industry were to a large extent interdependent and owed a great deal to each other was described by Sir Wallace Akers, F.R.S., a director of Imperial Chemical Industries, Ltd., in an address at the Textile Institute, Manchester, on 21 November.

The talk, the second of a series of inaugural lectures to mark the opening of the institute's new headquarters, was entitled 'The Chemical Industry and Textiles.'

There was sometimes a tendency, said Sir Wallace, to those in the chemical industry to be slightly patronising towards the textile industry by suggesting that the latter owed its size, success and importance almost entirely to the blessings graciously conferred on it by a benevolent, all-wise chemical industry.

Impertinent Attitude

Although it was never possible to fix exactly the date at which industries of such size and scope began, it could safely be asserted that the textile industry was much older than the chemical industry, and this attitude seemed, therefore, slightly impertinent.

On the contrary, there appeared to be an excellent case for holding that a considerable part of the 'heavy' inorganic chemical industry, and nearly the whole of its organic side, owed their development, directly or indirectly to the stimulus provided by the textile industry.

It was, for example, the textile industry which first demanded, in quantity and at reasonable cost, sulphuric acid, alkali and chlorine, while the insatiable appetite of textiles for a wider range of dyestuffs of ever-improvng fastness was responsible for the first large-scale manufacture of organic chemicals, and for the extraordinary growth of this branch of the chemical industry.

It would, however, have been unreasonable to expect that the close association between the two industries would not lead to independent contributions by the chemical industry. The invention of completely syntheic fibres such as 'Nylon,' 'Orlon,' 'Vinyon,' 'Terylene,' and so on, could be regarded as such contributions.

The Royal Society Awards

Three Chemists Honoured at Anniversary Meeting

EMINENT chemists were among the recipients of the 1952 medals awarded by the Royal Society which were presented at its anniversary meeting held in London on 1 December, by the president, Professor E. D. Adrian, O.M., who outlined their main work.

A Royal Medal was awarded to Professor Christopher Kelk Ingold for his extensive investigations of the mechanism of, and the factors influencing, organic reactions.

Over many years it has been Ingold's purpose to treat the mechanism of organic reactions in a quantitative fashion and to understand the factors influencing such reactions in terms of fundamental physical chemical concepts (Prof. Adrian said). Thus, for example, in the very early days he made the first successful attempt to understand the interaction between two ions, and between an ion and a permanent dipole, in terms of quantitative electrostatic factors and applied this work to the velocity of the esterification and hydrolysis.

Ingold and his co-workers, for the first time, gave a complete elucidation of the reaction between an ion and a polar molecule. They have studied the influence of substituents on the velocity of organic reactions and have made the most detailed and beautiful analysis of the structure of benzene. All this work is characterised by detailed experimental investigation in which quantitative data on the mechanism of reaction have been obtained.

Breadth of Vision

On this quantitative work it was possible for Ingold to base a detailed theoretical framework and it would be fair to say that no man has contributed with such detailed exactness and with such breadth of theoretical vision to our knowledge of the mechanism of organic reactions as he has. Moreover, his work and ideas are not only applicable to the particular reactions which he has studied. Ingold's ideas are at the very basis of quantum chemical theory: in some cases he has anticipated quantum mechanical ideas—in others he has been quick to see the application of such ideas to his own work.

The Davy Medal was awarded to Alexander Robertson, Professor of Organic Chemistry in the University of Liverpool. He achieved a world-wide reputation as an authority on the organic chemistry of those natural products belonging to the class of compounds containing heterocyclic oxygen atoms. Arising from his early studies with Sir Robert Robinson on anthocyanidins and anthocyanins, Robertson developed an interest in the natural glycosides, and his first major studies were in this field.

Robertson developed new methods of synthesis for biosides of phenols, and by a combination of analytical and synthetic procedures he established the structures of a large number of these substances, including indican, the natural glycoside of the indigo plant, and ruberythric acid, the glycoside of madder.

Natural Product Research

Following on these investigations, he commenced his long series of studies of hydroxyl-carbonyl compounds, and on heterocyclic oxygen compounds of natural occurrence. Compounds of these types include many of the familiar non-nitrogenous bitter principles of plants, as well as a variety of fish poisons and insecticides. Over the past 20 years Robertson's output of research in this field has been prodigious, and his work throughout has been marked by brilliance, alike in perception and execution. Among his many triumps may be mentioned his clarification of the chemistry of the rotenone group of insecticidal compounds from derris root, of usnic acid from lichens, of the complex natural colouring matters, rottlerin from kamala, dracorubin from dragons blood resin, and the pigments of the insoluble red woods.

It is worthy of particular mention that in all these cases Robertson was dealing with problems which had baffled many investigators and were regarded as chemical puzzles; such they would have remained but for Roberson's brilliant synthetic studies on oxygen-ring compounds in general. Further development from this point led to his clarification of the structure of the natural furano-coumarins and furano-chromones

and of the mould colouring matters, citromycetin and citrinin.

In another colouring matter isolated from a micro-organism, violacein, Robertson encountered the remarkable oxidation of hydroxyl-indole derivatives, which is bound up with the problem of melanin formation in animals, and he has since then made, and continues to make, notable contributions to our knowledge of the mechanism of melamin formation.

Robertson is, in short, a brilliant organic chemist, who has not only solved a long series of structural problems which had baffled earlier workers, but in so doing has opened up new fields of study.

Award to Professor Haldane

The Darwin Medal was awarded to Professor John Burdon Sanderson Haldane for his work on the analysis of the causes of variation and of the mechanism of selection. The conclusions derived from his researches have permeated practically every field of evolutionary discussion, and his ideas have fundamentally altered our knowledge of evolutionary change.

For many years he has insisted that a proper study of evolution involves the development of methods for investigation of the genetics of populations. His mathematical treatment of the question was the first of its kind and has played a large part in the great development of understanding of evolution during the past twenty-five years.

Haldane has been a pioneer in applying biochemical knowledge, especially of enzymes, to problems of genetics. His contributions to strictly genetical problems are fundamental. They included some of the earliest demonstrations of linkage in birds and mammals and of partial sex linkage in man. He made the first investigation of human mutation rates, has studied inter-specific hybrids and discovered the rule by which their sex is determined. He was one of the first to develop a theoretical treatment of polyploidy and to show its evolutionary significance.

By his detailed researches, Haldane has thus made first-rate contributions to the field of Darwin's work.

In his general address surveying the work of the Royal Society during the past year—the 290th of its existence—the president said it was a year in which a grievous loss had been sustained by the death of its Royal Patron, King George VI. The Queen had been graciously pleased to become Patron of the Society and the historic Charter Book was now adorned with Her Majesty's signature on the appropriate heraldic page, a reminder of the great privileges which the society had always enjoyed since the days of its Royal Founder.

An encouraging factor had been a steady reduction in the delay of publishing papers in the *Proceedings* and *Transactions*. The average time between the receipt of a paper and its publication had been 26 weeks for *Proceedings A* and since 12 June papers have taken less than 20 weeks. But costs continued to rise and, apart from the society's own publications there was the very serious problem of financing the publication of abstracts, particularly in the field of chemistry.

It was not right to rely unduly on the help of industry and of Government funds for such important work, but, said Professor Adrian, he would like to take this opportunity of thanking those industrial concerns which had contributed so generously to it. Everyone, scientists, industrialists and Government alike, knew the great value of our abstracting publications and no one could afford to relax their efforts to keep them flourishing.

A Further Grant

These abstracting services showed how scientific knowledge was expanding, but before tendering advice about them, the society ought, no doubt, to set its own house in order. The Library contained a wealth of scientific material and papers not yet adequately catalogued. Grateful thanks were due to the Pilgrim Trust for the grant it gave three years ago to enable the society to make a calendar of its papers from 1800 onwards and it had now earned renewed gratitude by providing a further grant.

One other benefaction should be mentioned. As the treasurer reported last year, the society had received the sum of £70,000 on account of the John Joseph Jaffé bequest. During the year for the first time it had been possible to award a 'Mr. and Mrs. John Jaffé Donation' from this bequest.

This first award was made to Sir Geoffrey Taylor, who retired from the Yarrow Professorship in February, 1952, but continued to direct an important research programme in Cambridge.

Metallurgical Section

Published the first Saturday in the month

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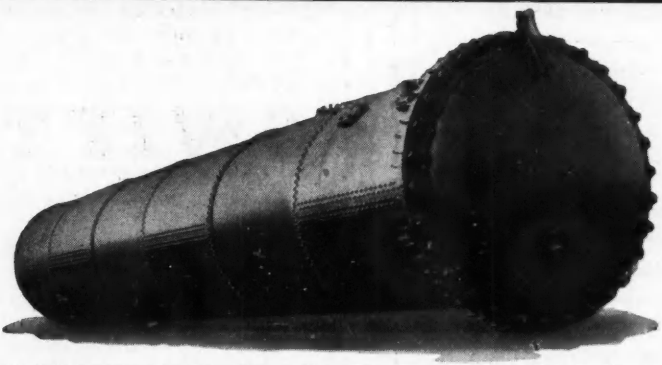

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Metallurgical Section

The Corrosion of Steel

The Efficiency of Phosphate Coatings & Protective Finishes

THE efficiency of phosphate coatings on steel as protection against corrosion, and the means of testing this efficiency and corrosion resistance in general were discussed at a meeting in London on 28 October. The meeting was organised by the Iron and Steel Institute in conjunction with the British Iron and Steel Research Association, with Mr. H. T. Shirley, chairman of the Corrosion Committee of BISRA, in the chair.

Four papers were presented and discussed: 'Phosphate Coatings as a Basis for Painting Steel,' by the Phosphate Coatings (Drafting) Panel of the British Standards Institution. 'Corrosion by Retained Treatment Chemicals on Phosphated Steel Surfaces,' by S. G. Clarke and E. E. Longhurst. 'Tentative Analytical Tests for Phosphate Coatings on Steel,' by R. St. J. Preston, R. H. Settle and J. B. L. Worthington. 'Second Report of the Methods of Testing (Corrosion) Sub-Committee.'

The first three papers were discussed together. The first was presented by Dr. J. C. Hudson, the second by Dr. Longhurst and the third by Mr. Preston. Dr. Hudson recalled that the initial purpose for which the Panel had been set up in 1944 was to consider tests of phosphate coatings and stoving paints for the Ministry of Works in connection with the large number of prefabricated houses then being built. BSI Publication PD.539 of 1946 had resulted from the Panel's work; this was really a code of practice, rather than a performance specification. It had proved useful, but the need remained for more specific tests, both analytical and of performance.

The present paper described the results obtained when analytical and performance tests were applied to industrial phosphate coatings.

Analytical tests included determination of (1) weight per unit area, (2) phosphate content, (3) moisture control, (4) hygroscopicity, (5) absorption value.

The performance tests used were the ARE seawater droplet test, the CRL sulphur dioxide test and outdoor exposures.

The main difficulty met with in considering specification was the wide variation between phosphating processes in current use both in coating weight and PO_4 content. Table I shows some of these variations, as revealed by analytical tests on six types of industrial phosphate coatings. Each process, however, was satisfactory for the purpose for which it was intended, and field tests had in fact shown that wide variations in the weight of phosphate coatings applied by the same process had no effect on coating efficiency when overpainted.

In spite of this it might be possible to draw up specifications for individual processes, if each specification were strictly limited to the particular process concerned and if the criteria of acceptance were suitably related to the purpose for which the phosphate

TABLE I
ANALYTICAL TESTS ON INDUSTRIAL PHOSPHATE COATINGS

Process	P	S	T	Q	V	R
Main cation in phosphate bath	Fe	Mn	Zn	Zn	Zn	Zn
Method of application	Immersion	Immersion	Spraying	Immersion	Immersion	Immersion
Duration of treatment, min.	15	30	1.5	4	5	12
Change in weight on phosphating, g/sq. ft.	−2.40	−2.43	0.24	0.31	0.15	0.54
Coating weight, g./sq. ft.	1.31	1.95	0.41	0.50	0.32	1.13
PO_4, g./sq. ft.	0.64	0.82	0.18	0.19	0.11	0.41
Moisture, mg./sq. ft.	7.5	7	14	34	16	71
PO_4, content of coating, per cent	49	42	44	38	34	36
Moisture content of coating, per cent	0.6	0.4	3.4	6.9	5.0	6.4
Hygroscopicity of coating, per cent	0.3	0.2	1.2	1.3	1.0	1.5
Absorption value, g./sq. ft.	1.05	1.0	1.0	1.2	1.0	1.1

coating was required. Such specifications might be based on a performance test for a specimen phosphated by the process under examination, and provided with a standard organic finish of oil, lacquer or paint. Experimental work to explore this possibility was in progress.

Dr. Hudson said that the BSI Panel had studied the effect of chromic acid additions to rinsing water on two industrial phosphate coatings. Small concentrations of chromic acid had a beneficial effect on the protective properties of the coatings but a high concentration dissolved the coatings. The permissible limiting concentration of chromic acid probably varied for different phosphating processes but even very dilute solutions with concentrations as low as 0.05 per cent might have a beneficial effect. The optimum concentration was probably about 0.1 to 0.2 per cent.

Hot Bath Phosphating

Dr. E. E. Longhurst introduced the second paper on corrosion by retained treatment chemicals which, he pointed out, concerned hot bath phosphating only. The work was directed to answer the question: 'How far is it necessary to wash the steel parts after phosphating?'

The answer varied, as might be expected, with the type of phosphating solution. In general, the risk of corrosion from solutions trapped in crevices or folds was less with the plain metal phosphate-phosphoric acid type bath than with accelerated phosphating solutions containing other constituents more active in stimulating corrosion.

Even with the plain type bath it was probably desirable to wash creviced parts after phosphating, though a relatively simple washing treatment to remove excess solution from recesses or from the mouths of crevices would be sufficient. With phosphating solutions containing other active consituents, washing was generally essential to remove residual corrosive solutions.

Dr. Longhurst supported these conclusions by a series of slides showing the condition of painted panels after test. He then suggested a simple performance test as a guide to the corrosive tendency of a solution if it was not known, or if the geometry of the parts treated made effective washing difficult. This test involved exposure of the parts to be examined to damp air for a period of one week in which period any dried out corrosive residues would tend to absorb moisture and become active.

In introducing the third paper on analytical tests for phosphate coatings Mr. Preston said that there were two possible lines of development. The first concerned the composition of the coating and the second concerned the coating's anti-corrosive qualities.

Laboratory tests to determine the composition of the coating included the measurement of moisture content, phosphate content (for which two simple tests had been developed) and chromate content. Tests to indicate the anti-corrosive qualities of the coatings included absorption value, coating weight and hygroscopicity.

Mr. Preston said that the last-named was a most important factor. Accelerators used in industrial processes introduced salts, which might attract water. For example, one firm of his acquaintance had encountered blistering due to salts contained in mains water; the difficulty had been overcome by an alteration in the process.

In the discussion which followed, the favourable results obtained from plain types of phosphating bath by Dr. Longhurst were commented on by Mr. R. J. Brown (Morris Motors, Ltd.). He said that these baths would be uneconomic in practice for many assemblies owing to the length of processing time. He suggested that the dip wash with very little agitation that Dr. Longhurst had employed might vitiate the comparison of his results with those from similar phosphate treatments which embodied a very efficient rinse with sprays.

Cause of Ring Blistering

Mr. Brown described how ring blistering of motor body finishes had been caused by water spots dropping on to clean body surfaces from overhead condensation points after phosphating and before painting. Even after continuous processing equipment had been introduced, trouble was encountered in the form of 'snail trails,' which were lines of fine blisters at the interface of the phosphate coating and the primer paint. An analysis of the rust associated with them showed the presence of calcium and chlorides. It appeared that incrustations of soluble salts in the overhead structure were being redissolved and were dripping on to the surfaces of the bodies. Further, one of the processing solutions used in the plant

was acting as a source of chlorides. Correction of these two factors achieved a major reduction in 'snail trails' but not their complete elimination from the plain body surfaces. The last source of contamination was found to be one which had been suspected quite early in the story; the water supply used had a total hardness of 40 parts per 100,000. The volume of water consumed put out of the question the use of treated water such as boiler condensate, so that it was considered necessary to prevent localised evaporation of the water contained on the body surface. Sprinklers were used for this purpose.

The corrosion trails were still not completely eliminated but the final step was taken with the advice of the CRL. This consisted of the operation of the chromic rinse without heating and the prevention of rotation of the bodies (the cars are held on a spit during the process) between the chromic rinse and the forced drying. Uniform drying was then possible over the entire body surface without the formation of trails of soluble salts.

Mr. R. F. Drysdale (Walterisation Co., Ltd.) reported work broadly parallel in nature to that described by Dr. Longhurst but mainly concerned with light-weight coatings applied both by accelerated and non-accelerated processes. He had had the best results from specimens treated with non-accelerated processes which had been dried unwashed; there was little to choose between those washed with water, chromic acid or soluble chromate solutions. Samples washed with a 0.03 molar phosphoric acid solution were comparable with those dried unwashed. In his view these differences in behaviour were associated with imperfect coating deposition within the seams owing to the poor circulation and, consequently, the exhaustion of the phosphating solution at such places.

Rinsing Advisable

Mr. A. Nicholson (Pyrene Co., Ltd.) considered the question of rinsing generally. He thought that, even with unaccelerated processes, rinsing was advisable when the parts were to be subsequently painted. There would otherwise be risk of osmotic failure of the paint film. He suggested that a cause of failure at seams was incomplete coating formation. Cleaning inside the seam was the first and most difficult obstacle in this case. Accelerated processes, by virtue of their lower temperatures, strengths and treatment times, could be less active than unaccelerated processes in these particular conditions. Production considerations of time and space necessitated the use of accelerated processes and means were available to deal with seam problems if they arose. For example, he had known one case where seam trouble had been cured by actually increasing the accelerator concentration of the solution.

Final Rinse Beneficial

He thought that a final rinse containing a small amount of phosphoric acid as well as chromic acid might be beneficial. The authors had mentioned a German patent concerning the use of a final rinse with zinc phosphate, which appeared to be comparable.

Mr. E. I. Brimelow (Building Research Station, DSIR), suggested there were dangers in assessing phosphate coatings by accelerated corrosion tests, particularly to determine the most useful concentrations of chromic acid in the rinsing solutions.

In reply to the discussion Dr. Hudson agreed with Mr. Brimelow that caution was necessary in such cases and re-emphasised that the optimum chromic acid concentration varied for different phosphating processes.

Dr. Longhurst replied commenting that Mr. Brown's interesting contribution related to a spray washing procedure, in which the car bodies being treated were never fully immersed and at times were fully exposed. Rapid evaporation had occurred from the hot exposed surfaces allowing concentration of soluble salts on the surfaces. These conditions varied considerably from those obtaining during treatment and washing by full immersion processes. He explained that in his own tests corrosion had occurred owing to the presence of certain constituents of residual phosphating solutions, and not by the action of added corrosive agents such as the salt spray in Mr. Drysdale's tests. He agreed that it appeared that small concentrations of phosphoric acid residues were not necessarily dangerous. In industrial practice, however, it was difficult to avoid major concentrations of phosphoric acid, owing to seepage from crevices or inefficient drainage on awkwardly shaped components. Minor defects would occur where

such concentrations occurred and, generally he was in favour of a quick rinse in even the most favourable circumstances.

Replying to Mr. Nicholson, Dr. Longhurst said that in the work described by Dr. Clarke and himself, they had not studied the efficiency of phosphating within the crevices, but only the corrosivity of treatment solutions seeping on to the exposed surfaces outside the crevices. He confirmed that nitrate had been detected chemically near the crevice mouths on the specimens which had been phosphated by the accelerated process and subsequently washed.

Introducing the Second Report of the Methods of Testing (Corrosion) Sub-Committee, Dr. Hudson said that as a result of the sub-committee's work two laboratory tests for resistance to corrosion had been standardised and would shortly be published as B.S. 1391: 1952. These were the ARE salt droplet test and the CRL test, which were based, respectively, on tests originally designed by the Armament Research Establishment and the Chemical Research Laboratory.

Collaborative Work

The development and standardisation of these tests had involved collaborative work in many different laboratories. In some respects the reproducibility of the tests was not all that might have been wished but it was generally as good as was to be expected in this type of experiment.

Dr. Hudson observed that reproducibility must be affected by the fact that any order of merit of a number of protective schemes could vary with the conditions of exposure, the type of service and the criterion on which failure was assessed. It was doubtful whether a laboratory test would ever give a hard and fast correlation with the results of service. Their best function was probably to ensure reproducibility of a given standard for a protective scheme of a given type. They were of great value in weeding out unsatisfactory protective schemes, but became fallible when it was a case of distinguishing between several good or excellent protective schemes.

In the Sub-Committee's attempts to adjust the criteria of failure so that a protective scheme would be equally likely to fail from general rusting or from the effects of damage, he thought that there might have been some tendency to exaggerate the effects of damage on performance. Often, although failure occurred at a damaged area, rusting remained localised and might even be stifled. In the new British Standard B.S. 1391: 1952, therefore, the infliction of damage before testing had been made optional, so that a user expecting damage to be the determining factor under his particular service conditions, could use the standard methods of damage before the tests. Otherwise, the tests could be carried out on undamaged specimens.

Aluminium Scrap in the U.S.A.

Approximately 23,369 short tons of metal were recovered from 26,148 short tons of purchased and toll-treated aluminium-base scrap consumed during the month of May according to the Bureau of Mines, United States Department of the Interior. Of the total metal recovered, 18,220 tons were from new scrap, 5,124 tons were from old scrap and 25 tons were from clean imported scrap. Compared with April, total scrap consumed during May declined 10 per cent. Consumption of new scrap, classified as cast, borings and turnings, and dross and skimmings declined about 18 per cent. A greater decline (about 34 per cent compared with April) was in the consumption of old alloy sheet and aircraft scrap. Distribution among consumers was as follows: secondary smelters and reclaimers 71 per cent, primary producers 24 per cent and foundries 5 per cent. Scrap was reported as being plentiful in most areas and was moving slowly.

Frankfurt Metallurgical Laboratories

Foundations of a new laboratory for chemical metallurgical and engineering research have been laid in Frankfurt by the American Batelle Memorial Institute, which was founded and endowed to conduct research for industry on a non-profit-making basis. At the same time Batelle director, Mr. Clyde Williams, has announced that the institute is to set up another research centre at Geneva, Switzerland, and the formation of other centres in Western Europe is contemplated. Land for the Frankfurt laboratory, which is expected to cost about $1,500,000 to build and equip, was presented as a gift by the city corporation.

South African Uranium Production

Prime Minister Opens First Plant

SOUTH Africa's first uranium production plant was opened by the Prime Minister on 8 October at the property of West Rand Consolidated Mines, Ltd., Krugersdorp. The information so far disclosed about the possibilities of the new industry is not complete, but the following forecasts have been made from authoritative sources.

There are at present thirteen mines which have contracted to supply uranium shortly, and four more are expected to be added to this number. The capital cost of the present programme of plant construction is likely to exceed £40,000,000. The estimated cost of plant to each mine apparently varies from £1,600,000, which was the cost of the plant on West Rand Consolidated, up to sums of the order of £5,000,000. The capital cost is being met by loans from British and American sources, repayable over ten years from the proceeds of uranium sold to those countries on a cost-plus basis.

The quantity of uranium to be produced annually has not been disclosed, but the Minister of Mines mentioned in March that the quantity originally agreed upon in 1950 had been trebled in the agreement of December, 1951, and the Prime Minister stated at the opening of the West Rand Consolidated plant that the annual gross revenue of projected plants when in full production (which is expected in two or three years' time) would probably yield £30,000,000.

Widely Distributed Element

Uranium, though regarded as a rare metal, is one of the widely distributed elements. It occurs in minute quantities in granites and other rock types, from which it may be concentrated by hydrothermal action into rich deposits of the lode or vein type. When these deposits are eroded, the uranium, being a heavy mineral, concentrates with the more resistant portion of the rock to form pebbles. In South Africa, the concentration of gold and uranium were adjacent in certain areas and, both having a high specific gravity, remained together when the erosion which provided the material for the Witwatersrand system was taking place. Thus in the conglomerates of this system are found every variation from no gold or uranium at all (of economic importance) to important concentrations of either or both. Uranium is to be recovered in the form of uranium oxide from tailings passing from the reduction plant before they go into the slimes dam. It is present in accumulated slimes dams and sand dumps in varying quantities, and it is the intention of some of the mines associated with the uranium programme to treat these as well as current residues.

Much Sulphuric Acid Used

In the extraction of uranium oxide, large quantities of sulphuric acid are used, and it is fortunate that the gold-bearing conglomerates of the Witwatersrand contain sufficient iron pyrites for the production of this acid. Certain mines are to undertake its manufacture. The concentration of uranium in gold-bearing ore is low and it is only because it can be treated as a by-product of the gold-mining industry that its extraction becomes economically possible.

All uranium recovered will be sold to the South African Atomic Energy Board, constituted by Act of Parliament. The Government, it is understood, intends to export all uranium oxide produced in the Union for the time being, but under the agreement with the United Kingdom and United States, as much uranium as may be required for the Union's own purposes may be retained.

Work on South Africa's first cyclotron has already been started and it is expected that it will be operating by April, 1954.

According to an article in the *South African Mining and Engineering Journal*, it is estimated that the cyclotron will cost about £56,000. The underground hall in which it will be housed, is under construction on the site of the Council for Scientific and Industrial Research at Pretoria and will cost about £42,000.

The cyclotron will be used to produce short-lived radioisotopes which cannot be imported by air. These radioisotopes will be used for research on physical, chemical, agricultural and medical problems. A nuclear physics institute will be erected next to the cyclotron hall during 1953 at a cost of about £55,000. The cyclotron will be controlled from this building.

Analysis of Iron & Steel

ADDITIONAL parts to the British Standards for Methods for the Analysis of Iron and Steel (B.S. 1121) continue to appear as the need arises. Parts 25 and 26 (THE CHEMICAL AGE, **67**, 607), have now been followed by part 27, Determination of Vanadium in Carbon and Low Alloy Steels, and part 28, Determination of Graphitic and Combined Carbon, Pig and Cast Iron.

Part 27 is for determining up to one per cent of vanadium and except at very low vanadium contents the alloying elements normally present in low alloy steel do not interfere.

The principle of the method is solution of the sample in phosphoric-sulphuric acid, oxidation of the iron with nitric acid followed by oxidation of the vanadium at atmospheric temperature by means of potassium permanganate. The excess reagent is destroyed by the addition of of sodium nitrite and the oxidized vanadium is reduced with an excess of ferrous ammonium sulphate. This is back-titrated with standard potassium dichromate using barium diphenylamine sulphonate indicator.

Determination of graphitic carbon in irons containing up to 4½ per cent carbon is dealt with in part 28.

Investigations of the total and graphitic carbon are carried out separately and the combined carbon is calculated by difference. The total carbon is determined by combustion during a procedure similar to that described in B.S. 1121, Part II 'Determination of carbon in steel and low carbon ferro-chromium.' The graphitic carbon is determined by decomposing the sample with nitric acid, filtering off the residual graphite, igniting the residue in a stream of oxygen and absorbing and weighing the carbon dioxide as described in B.S. 1121, Part II.

Copies of these standards may be obtained from the British Standards Institution, Sales Branch, 24 Victoria Street, London, S.W. Price 2s. each.

Powder Metallurgy Journal

A NEW journal, *Planseeberichte Für Pulvermetallurgie*, is to be published three times a year in Reutee, Tyrol, Austria. It is being edited by Dr. Paul Schwarzkopf and Mr. F. Beneskovsky and in the first issue, published in October, it is announced that it will replace *Powder Metallurgy Bulletin* formerly published by the American Electro Metal Corporation of Younkers, New York. The title of the new journal is derived from the fact that the Plansee metal works have become the world centre of powder metallurgy research and application. A world congress on the subject was held there in 1948 and since then annual international symposiums have been organised. Both of the editors are employees of this firm although Dr. Schwarzkopf is also associated with the American Electro Metal Corp.

The journal will contain scientific and technical papers on powder metallurgy, sinter technique and allied subjects as well as book reviews, abstracts and news items. The first edition contains an illustrated article by Mr. Beneskovsky on the history of the Plansee works, and a paper by R. Kieffer and F. Kolbl on the development and properties of heat- and corrosion-resistant alloys, especially titan alloys with nickel-cobalt-chromium binding.

Zinc Trading Free

FREE trading in zinc will be resumed on the London Metal Market on 2 January, it has been announced by the Ministry of Materials. The Directorate of Non-Ferrous Metals will terminate its existing sales arrangements on 31 December. Consumers wishing to do so can purchase in December zinc for January delivery on the Ministry's usual terms.

In its statement, the Ministry emphasises that its policy on disposal of Government-held zinc stocks will be 'to release not more than a relatively small tonnage for sale during the early months after the resumption of private trading.

The arrangements for disposal of Ministry stocks have been arrived at, it is added, 'in full consultation with producers, consumers, and members of the London Metal Exchange.'

Zinc will be made available through the Exchange and through other normal trade channels, and will be adequate, the Ministry says, to meet the requirements of consumers.

A further announcement is promised about import-export licensing arrangements.

The Ministry's stocks of zinc for disposal after 2 January will be about one year's normal U.K. consumption.

Gold Recovery from Cyanide Solutions

New CRL Ion-Exchange Method Promising

A NEW process for the recovery of gold from cyanide solutions has been patented by the DSIR. It eliminates the traditional method of zinc precipitation and was developed at the Chemical Research Laboratory by F. H. Burstall, R. A. Wells, Phyllis J. Forrest and N. F. Kember, where it was shown at the recent CRL Open Day.

The pregnant liquor is first passed through an ion exchange resin, which removes the gold together with such impurities as copper, nickel, zinc, iron, cobalt, silver, etc. The next step is to regenerate the resin, and it is here that the investigators at the Chemical Research Laboratory appear to have broken entirely new ground. All the usual regenerators were tried but with none of them could complete recovery of the gold be achieved. In place of the inorganic solvents which had always been employed in the past, it was therefore decided to try organic solvents containing acid, and by means of this new approach to the problem the gold was successfully extracted.

Eluting Agents

It was still necessary, however, to find several simple aquous eluting agents which would remove the various metallic impurities, yet leave the gold behind. Among the agents finally selected were dilute hydrochloric acid, which removes nickel and zinc, and cyanide solutions, which take out the copper and other metallic impurities. In the process as finally developed there are thus two steps, the first being an absorption stage in which the various metals are taken up by the resin, followed by an elution of contaminating metals, leaving the gold in the resin. The cycle is repeated until the amount of gold remaining in the resin is such that it can be extracted economically with the organic reagent. Regeneration is then complete and the resin is ready for re-use.

Basic materials for the production of ion exchange resins are by no means cheap, but the resin can be used over and over again, so that it is only the initial outlay which is high. Should the demand be sufficient to warrant its preparation, virtually any type of ion exchange resin could be produced. At present the CRL workers are using Amberlite IRA400, a commercially obtainable resin which is available in large quantities in the United States. An equivalent of this American material, Deacidite FF, is made in Britain by Permutit, Ltd. The aquous eluting agents used in the process are all inexpensive materials which are readily available in any reduction plant.

The process should thus be relatively cheap to operate, and not only is the extraction of the gold very efficiently accomplished, but other metals present in the cyanide solution may be recovered as well. Another advantage is that the regenerated resin can be used far more often in the pretreatment of the ore that can the zinc in the normal precipitation process.

Due to the very small quantities of gold involved, the investigators at the Chemical Research Laboratory have only been able to carry out experiments on a laboratory scale. The ground work has been accomplished and it has been shown that the process developed is inherently sound, although like any other method of treatment it must be adapted to the special requirements of individual ores.

There is still much development work to be done before its practical value can be accurately assessed, but the team are confident that the process is capable of giving satisfactory results in commercial operation. It is hoped that some gold mining company will be sufficiently impressed with its potential advantages to sanction the erection of a pilot plant on which it can be tried out on pilot plant scale.

First Electrolytic Copper

The electrolysing plant at the Mufulira mine on the Northern Rhodesian copper belt came into operation on Saturday, 29 November, when the first electrolytic copper was turned out. Only one unit is working at present, with a monthly capacity of 3,000 tons. Eventual production will be about 6,000 tons of electrolytic copper a month when the whole plant, which will cost about £4,000,000, comes into operation.

Substitutes for Nickel Plate

Atmospheric Exposure Tests

OWING to the present shortage of nickel, it is being found difficult, if not impossible, on many types of article, to produce a nickel deposit sufficiently thick to give sound protection under service conditions. As a result there is intense interest in possible alternatives to a heavy coating of nickel as an undercoat to chromium plating for protective and decorative purposes.

A number of substitute undercoats have been suggested and many claims have been made for them. For example, white brass (80 per cent zinc, 20 per cent copper) and tin bronze (90 per cent copper, 10 per cent tin), have been suggested, while in some cases satisfactory results have been claimed by chromium plating either directly on a copper deposit or on a heavy copper deposit followed by a thin coating of nickel. Although some of these alternatives are at present in service, there appears to be little or no reliable comparative information as to their performance.

It is obviously desirable to obtain as soon as possible a sound indication of how these various coatings will withstand atmospheric corrosion in general service conditions. This is all the more necessary in view of the fact that such finishes may be applied on export work.

Tests Unreliable

Accelerated corrosion tests (by which different types of deposits might be compared), are unreliable, and the only acceptable method is to place a large number of samples in several differing atmospheric corrosion sites and to average the results.

A large-scale investigation on these lines has, therefore, been instigated by the British Non-Ferrous Metals Research Association. Over 1,000 sample steel stampings have been plated by various processes by member firms and others interested. These samples are being exposed at three atmospheric exposure sites, representing a marine and two types of industrial area, mild and severe. A further set is being subjected to an accelerated corrosion test for comparison purposes.

Thicknesses of the plating applied are being checked by means of microsections, and the results of the exposure tests will be assessed on a quantitative basis and averaged so as to give a reliable indication of the performance of the specimens. Each type of plating has been duplicated by two different plating shops, and four samples of the work of each are exposed on every site. Both standard and proprietary solutions have been used. Half the specimens will be regularly cleaned while the remainder will be left untouched.

Valuable information on the performance of the various types of finish employed is expected in a few months time.

Welding Research

A SIMPLE weldability test for high-tensile structural steels under workshop conditions known as the Controlled Thermal Severity (CTS) test is described in the October issue of *Welding Research* (Vol. 6, No. 5), published by the British Welding Research Association.

Procedure is based on the metal-arc welding process, and the test was designed for material in the form of angle, channel, plate, and so on, from which only narrow and relatively thin specimens might be obtainable. The test was originally developed under the guidance of the F.M.2 committee of the British Welding Research Association and is included in British Standards Specification final draft No. CO/WEE/4656.

Weldability as understood for the purposes of this test is essentially the measure of the resistance of steel to the development of cracks in the welded joint, particularly in the heat-affected zone adjacent to the weld bead.

The test is based on the work reported under the title 'Correlation of Weldability Tests with Structural Joints,' which was published in the February, April and June, 1952, issues of the journal.

An extensive programme of work on the spot welding of aluminium alloys has been carried out by the British Welding Research Association on behalf of the Ministry of Supply. The object of the work was to improve the consistency of spot welds in aluminium alloys by suitable control of the many 'variables' concerned. The research programme included investigation of surface preparation, electrode contour, load cycle and secondary wave shape.

Electro-Finishing of Metals

RIC Lecture & Discussion

ELECTRO-FINISHING of metals was the subject of a paper and discussion at a joint meeting of the London and South-Eastern Counties Section of the Royal Institute of Chemistry and the Sir John Cass Chemical Society held at the Sir John Cass College on 28 October, with Dr. C. W. Herd in the chair.

The lecture, which was illustrated by slides showing the crystal structure of various deposits and various features of large-scale electrodeposition, was given by Dr. S. Wernick, F.I.M., F.R.I.C.

Electroplating for protective and decorative purposes was the widest application of the electro-finishing of metals, said Dr. Wernick. It was first carried out with carbon-zinc batteries in printing processes, and methods had developed with the help of the dynamo and the rectifier, until plating with chromium, tin, cadmium, zinc, silver, copper, copper/zinc and nickel/cobalt alloys, together with many other metals for more specialised purposes, was extensively carried out today.

The surface of the base metal should be treated by degreasing and by removal of any layer of strained metal, since the crystal structure of the base metal can be continued into the plating. A thin deposit will exhibit porosity, which becomes less as the coating increases in thickness.

A well-deposited layer of nickel or tin one to two-thousandths of an inch in thickness should be free from porosity. If the protective metal is electropositive to the base metal, corrosion may be accelerated if both are exposed.

Specially Shaped Anodes

When the plating bath has small 'throwing power,' recesses in the article may not be effectively plated. To some extent this can be overcome by specially shaped anodes, by the use of auxiliary anodes, or by insulated screens to prevent over-deposition on raised areas.

Building up worn or badly machined parts by electrodeposition permits the salvage of components which would otherwise be scrapped. Chromium is particularly useful, due to the formation of a maze of fine cracks which retain lubricant. Subsequent heat treatment is sometimes necessary since the deposition may cause embrittlement of the base metal.

Electroforming is used for the reproduction of very fine detail, as in electrotyping and the manufacture of gramophone records.

Throwing Power

Replying to the chairman, Dr. Wernick gave several examples of the deposition of alloys and mentioned some of the factors affecting the throwing power of a bath. Dr. Griffiths was told that a bath of good throwing power was one which gave a uniform deposit at all locations. Although attempts had been made to define throwing power quantitatively, none were quite satisfactory. In general, dilute solutions and large distances favoured uniformity of deposit.

It was suggested by Mr. Spencer that the presence of the metal in the bath as a complex might favour uniform deposit, and Dr. Wernick agreed, pointing out that any attempts to speed up rate of deposition affected the uniformity of deposit adversely.

Answering an inquiry from Mr. Westwood about the ratio of sulphuric to chromic acids needed for chromium deposition, Dr. Wernick replied that although a ratio of one to 75 or 100 was critical, the exact function was unknown, and added, in response to another question, that chromium deposited on aluminium had poor adhesion.

Mr. Nyman was told that stresses in the base metal were not necessarily continued into the plating; they were often due to the occlusion of hydrogen. Mr. Martin asked about the composition of a bright nickel plating bath. Dr. Wernick said that bright nickel deposits were achieved by the addition of either cobalt salts to the bath, or small quantities of organic material. Mr. Tucker was given an account of the principles of anodic electro-polishing.

A vote of thanks to the lecturer was proposed by Mr. Spencer. In his reply, Dr. Wernick stressed the opportunities for chemists in the field of electrodeposition. Dr. Herd thanked the authorities of Sir John Cass College, and Dr. Ward replied.

The Chemist's Bookshelf

A TREATISE ON PHYSICAL CHEMISTRY. Vol. II: States of Matter. Third edition. Edited by H. S. Taylor and S. Glasstone. D. Van Nostard & Co., New York; MacMillan & Co., Ltd., London. 1951. Pp. v + 701. £3 15s.

In 1924 the first edition of 'A Treatise on Physical Chemistry' was published in two volumes. It soon achieved a high reputation which was consolidated by the appearance of a second edition in 1931. Then, some ten years ago, the publishers decided that the growing status of physical chemistry demanded an expansion of the treatise to five volumes. Volume I, *Atomistics and Thermodynamics*, appeared in 1942. It had originally been intended that the other four volumes should follow at short intervals under these sub-titles: *The States of Matter, Chemical Equilibrium, Chemical Kinetics, Molecular Structure.* This programme was upset by the war. The present volume announces that it is happily under way again.

The scope of Volume II is quickly revealed by the table of contents. There are five chapters, each written by an authority. They are: 'The Kinetic Theory of Ideal Gases,' by K. F. Herzfeld and H. M. Smallwood, pp. 1-185; 'The Thermodynamics and Statistical Mechanics of Real Gases,' by J. A. Beattie and W. H. Stockmayer, pp. 187-352; 'The Liquid State,' by G. E. Kimball, pp. 535-419; 'X-ray Analysis of the Solid State,' by J. G. White, pp. 421-508; 'The Colloidal State and Surface Chemistry,' by J. W. Williams, R. A. Alberty and E. O. Kraemer, pp. 509-692.

Although nine different authors have contributed to this volume there is throughout a co-ordination and uniformity of treatment which enhances the reputations of Professors Taylor and Glasstone as general editors. The presentations of the various topics are thorough and lucid, and references to the latest available literature are everywhere included. If the same high standard can be maintained in the volumes yet to come the complete set will provide a comprehensive and authoritative treatment of physical chemistry to which no library could afford to deny shelf space. For those who are specially interested in any or all of the 'States of Matter' the present volume supplies under one cover the essence of five monographs. Viewed in this light, and bearing in mind the elegance of production and binding, the price demanded is reasonable. There is a good general index.—H. MACKLE.

MODERN RADIOCHEMICAL PRACTICE. By J. B. Cook and J. F. Duncan. Oxford University Press, London. 1952. Pp. xx + 407. Figs. 108. 42s.

With the rapid growth of interest in the applications of radioactive tracers to chemistry there is a realisation of the need for sound training in the new techniques required. It is by no means enough to have a good chemical training and an average knowledge of the theoretical aspects of radioactivity. While personal experience in one of the major radiochemical centres is obviously still the soundest way of acquiring such training, the demand is such that this cannot be offered to everyone who would like it. In any case, most university chemistry departments realise now that some form of radiochemical work must be included in their practical courses. For this purpose a good textbook is clearly a marked advantage.

The present book aims at filling the demand in as wide a sense as possible. In the first two chapters sufficient stress is laid on the theory of radiochemistry to enable the ordinary chemist to appreciate the remainder of the book. At the same time the book is written for the practical worker, and therefore practical requirements are kept well to the fore throughout.

Methods of measurement are fully dealt with so that the necessary instruments can be chosen and used properly, but no details are given of the electronics of these instruments since this would be outside the province and probably outside the capabilities

of the average chemical worker. Such matters as the uses of radio-tracers, the choice of radioactive materials, the errors to be expected in radiochemical work, and the highly necessary precautions in laboratory design and organisation arising from the hazardous nature of radioactivity, are all fully and clearly discussed.

The book closes with a series of thirty experiments with radioactive material which are carefully designed to illustrate both the methods and the precautions required. The experiments have been chosen with a view to their application in the average laboratory, and therefore they require the minimum of equipment and health precautions. Work at high radiation intensity, which requires remote control techniques, has been omitted.

As an introduction to this exceedingly important modern branch of chemistry the book can be highly recommended. All teaching laboratories and all laboratories concerned or likely to be concerned with tracer work should certainly possess a copy. —C.L.W.

VOM KRISTALL ZUM LEBEWESEN. By Hans Vogel. Grundlagen der Biogenese. Hans Carl, Nürnberg. 1952. Pp. 320. Dm. 12.50.

This work has a two-fold aim: to explain how life may have arisen from the inorganic, and to stimulate reconciliation between the scientific outlook and acknowledgement of the Divine. The latter undertaking Dr. Vogel finds very needful in an age where discovery has served only to obscure the nature of the relationship between man and his Maker. Dr. Vogel seeks to follow the development of life upward from the inorganic, because in his view earlier treatments of the 'problem,' starting with higher forms of life, were bound to fail—as if we were to approach an inorganic molecule in a rock formation *via* detailed study of a mountain range. Another difficulty has been the need to acknowledge the unknowable: our physicists admit unpredictability, but are afraid to use the word God, in this case, lest they appear unsophisticated. In his embarrassment and exasperation the scientist turns away from God, yet Dr. Vogel concludes, if there are no secrets 'God would not be God.' Dr. Vogel's approach is based on religious belief, linked with traces of an optimistic philosophy that the inorganic had in some way to progress toward life.

The study proper starts from the viewpoint that there is a tendency in nature to the formation of ever greater units, to collectivity, and Dr. Vogel's inquiry ranges from simple inorganic forms through the typical macromolecules to the viruses and phages. Dr. Vogel prefers the 'cold' theory for the origin of the earth, as allowing a longer period for the development of life than the 'cooling-off' theories would permit. He reviews the chemical elements, stresses the importance of water as a medium favourable to reactions, and thereby biogenesis, and gives special attention to silica as an inorganic analogue to carbon, as if Nature had been practising for the later developments with carbon. The macromolecule appears to be the first intrinsic condition for life, and accordingly Dr. Vogel designates the clays and colloids found in muds as the cradle of life.

Looking forward, he presents the macromolecular forms in the shape of proteins, nucleoproteins, carbohydrates and lipides. The main difference between these and living forms is the absence of functionalism. The macromolecular forms have dynamic properties and the possibility of self-multiplication; Dr. Vogel makes much use of the word 'dynamic' in his later discussion. He gives a table of physical magnitudes ranging from blood corpuscles to the hydrogen molecule, and suggests that, in its genesis, life seems to be, among other things, a function of size.

The viruses are given attention because, while in the living cell they have characteristics of living organisms, yet, in isolation they have properties of a chemical compound. The section entitled 'Bases of Life' ends with a brief review of enzymes, vitamins and hormones. A further section treats the cell, development of cell-wall, photosynthesis, sexuality and the nature and influence of environment, keeping always in view the idea of functionalism. In the last major section Dr. Vogel discusses the development of unicellular forms: bacteria, protozoa, algae. Consideration of multicellular forms is excluded, as going too far away from the 'original' living matter.

Analysed chapter headings take the place of an index, and there is a short book-list, adequate for the (German) general reader for whom Dr. Vogel primarily writes.—K. BROOKE.

HOME

Patents Lecture

The British Association of Chemists will be holding a lecture on Wednesday, 14 January, 1953, at the Wellcome Research Institute, 183-193 Euston Road, at 7 p.m. The title of the lecture is 'Patents and the Chemical Manufacturer' and it will be given by N. F. Baker, B.Sc., F.C.I.P.A.

Change of Address

Messrs. F. Haworth (A.R.C.), Ltd., of Square Street, Ramsbottom, Lancs., have announced that as and from 1 December their address for all correspondence, callers and deliveries has been Irwell Chemical Works, Kenyon Street, Ramsbottom. The telephone number is Ramsbottom 2067 and the address for telegrams: 'Cements,' Ramsbottom.

Fertiliser Subsidy

Soil analysis has shown much of the land in the Isle of Man to be short of potash. Potassium chloride has consequently been included in the list of fertilisers on which a Government subsidy is allowed.

Highest in Twenty Years

Imperial Chemical Industries, Ltd., Billingham-on-Tees, have announced that during October, 39,979 tons of sulphate of ammonia were produced, the highest monthly figure since 1932.

Annual Dinner & Social

The annual dinner and social evening of the Society of Cosmetic Chemists of Great Britain will be held at the St. Ermin's Hotel, Caxton Street, Westminster, London, S.W.1, on Thursday, 22 January, 1953, at 7 p.m. for 7.30 p.m. Tickets, price 18s. 6d. each may be obtained from Mr. E. Polan, 228 Worple Road, Wimbledon, London, S.W.20.

Larger Premises

Elliott Brothers (London), Ltd., manufacturers of electrical, electronic and process control instruments, announce the transfer of their Birmingham branch office to larger and more modern premises at 181 Corporation Street, Birmingham 4 (Telephone Central 8313). This new branch office is now the area sales, service and instrument repair centre for the Midland counties including Warwickshire, Worcestershire, Staffordshire, Shropshire, Northants and Leicestershire.

Chemical Employment

There was little change in the numbers employed in the chemical and allied trades in Great Britain at the end of September according to the industrial analysis. The total figure of 477,900 showed an increase of 700 over August, but was 11,400 lower than at the end of 1951. Numbers wholly unemployed at 13 October, 1952, in Great Britain (men and women) totalled 6,271.

Technical & Scientific Register

The total number of persons enrolled on The Technical and Scientific Register, 13 October, 1952, was 5,795. This included 3,958 registrants already in work but who desired a change of employment, and 1,837 registrants who were unemployed. During the four-week period 16 September to 13 October, 388 vacancies were notified, 187 were filled and 430 were cancelled or withdrawn.

New I.C.I. Rayon Centre

A project to build an administrative, technical service and research establishment is reported to being developed by Imperial Chemical Industries, Ltd., in the Harrogate district, in connection with its 11,000,000 lb. a year 'Terylene' plant now under construction at Wilton. The Harrogate area has been chosen for the site of the new centre because of its proximity to the main textile areas in which the greater part of the Terylene output will be processed and because at the same time it is within reasonable distance of Wilton and the two pilot plants. It is proposed to have some of the new laboratories and offices ready for occupation by the end of 1954.

G.P.O. to the Rescue

For some time Vinyl Products Ltd., Butter Hill, Carshalton, Surrey, have been cursed by having inadequate telephone facilities. Owing to the rapid expansion of their business the switchboard became too small for the company. Now the firm have announced that the G.P.O. have laid miles of cable and granted them a new telephone number and many more lines, and in a letter to their customers and friends the hope is expressed that these difficulties have gone forever. The new number is Wallington 9282.

OVERSEAS

New Aluminium Bronze Product

A new aluminium bronze known as 'brolium' has been developed by an Australian company in Melbourne, Victoria, it is reported. Its mechanical properties are said to give the characteristics of a forging when it is treated to an accurately dimensioned casting. The metal has a high electrical conductivity and can be cold-worked. Its resistance to chemical corrosion makes it suitable for suspension hooks in hot-acid pickling processes.

Uranium Find

Small-scale deposits of uranium have been discovered 10 miles from Salisbury, Southern Rhodesia, by a prospector searching for tantalum ore in the form of microlite. An analysis has shown that the ore contains 77 per cent tantalum oxide, six per cent columbite, two per cent uranium oxide and 1 per cent thorium. A mining company is said to be negotiating to start work on the site.

Improved Dyeing Plant

A revolutionary dyeing and scouring machine, said to be the most efficient ever made, was demonstrated recently at the Hussong Walker Davis plant in New York. The new machine, designed by Mr. Boyce C. Bond, sales manager of the Pittsburgh Coke & Chemical Co., is said to be able to handle from 20 to 120 yards of cloth per minute, depending on the type of cloth and dye.

Drop in Canadian Prices

Most notable change in chemicals during the past month was the sizable price drop in alcohols and some solvents, reports the Purchasing Agents' Association of Toronto. This price decline is attributed to, firstly, the Cuban molasses market drop from 20 cents to approximately 7 cents per U.S. gallon over the past few months; another contributing factor has been the increased production of alcohol derived from cellulose production. The market is not regarded as firm at this time. The slight change in petroleum products has meant a fractional reduction in some industrial petroleum derivatives. Fatty acids and their derivatives have been fluctuating slightly.

Norwegian Pyrites

A new pyrites mine at Skorovas, North Norway, started production last week. The mine will produce about 150,000 tons of pyrites a year. The Skorovas pyrites are rich with a sulphur content of up to 51 per cent. The total deposits at Skorovas are put at 7,500,000 tons. Much of them contain copper at the rate of about 1.5 per cent. The Skorovas mine is the first mine in Norway to use the heavy media process for refining and enriching the ore.

To Manufacture Saran

Dow Chemical International, Ltd., have announced the granting of a licence for the manufacture of Saran (polymers and copolymers of vinylidene chloride) to the United Saran Corporation of Rehovoth, Israel. The managing director of the new corporation is the former head of the Supply Division of the Israel Defence Ministry, Mr. Joseph Jacobson. Key technical personnel are being trained in America. These will later train Israelis in the manufacture and weaving of Saran fibres. The basic material will be sent to Israel by Dow Chemicals.

Artificial Fertiliser Factory

An artificial fertiliser factory with a daily capacity of 6,000 tons is to be built at Kutahya, Turkey, it is reported. The Ministry of State Enterprises is in negotiation with the German firm Badische Anilin Anstalt of Karlsruhe, which is interested in the erection of this new plant. German specialists have already visited Kutahya and have made preliminary investigations. The factory will occupy an area of approximately 1,000,000 square metres. The raw material will be obtained from rich lignite deposits 20 kilometres from Kutahya. The new plant will cost 60,000,000 liras, of which 50 per cent will be financed by the German firm.

Pakistan Fertiliser Works

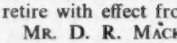
It was reported from Karachi last week that Pakistan has signed an agreement with Union Chimique Belge for the erection of a £5,500,000 fertiliser factory in the Frontier Province, Pakistan. The American Technical Co-operation Administration is providing $4,000,000 to help finance the project.

· PERSONAL ·

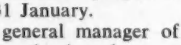
At a meeting of the board of directors of Monsanto Chemicals, Ltd., held on 25 November, it was announced that MR. A. D. DAYSH, director of the company, will retire with effect from 31 January.

MR. D. R. MACKIE, general manager of sales, was appointed to the board as an additional director.

Mr. Daysh, who was appointed a director in November, 1940, joined the company in July, 1920. Appointed assistant sales manager in 1931, he became sales manager in 1934.



Mr. D. R. Mackie



Mr. A. Daysh

A member of the Pharmaceutical Society of Great Britain, Mr. Daysh is also a member of the Council of the Association of British Chemical Manufacturers and represents the chemical industry on the Grand Council of the Federation of British Industries.

Mr. Mackie joined the company in August, 1924, and became assistant sales manager in 1940. Appointed sales manager in 1942, he became general manager of sales in 1948. He is a past member of the Council of the British Pharmaceutical Industry.

Mr. Mackie will, in addition to his appointment as a director, retain his present position as general manager of sales.

MR. C. O. M. STEWARD, A.R.C.S., F.R.I.C., 25 Altar Drive, Heaton, Bradford, executive director. W. J. Whitehead (Laisterdyke), Ltd., Bradford, originator of the method of estimating 'drag' in worsted tops by the use of a single thread tester, has been elected a Fellow of the Textile Institute.

During the war, Mr. Steward devised and carried into large-scale production processes for hydrolysing wool wax, and for isolating wool wax alcohols and cholesterol in pure form from the mixed alcohols. In addition, he has patented apparatus for measuring evenness of textile yarns, and for testing fastness to rubbing.

MR. J. D. BUXTON, general works manager of the Stork Margarine Works, Bromborough, Cheshire, has joined the board of Van den Berghs & Jurgens Limited.

Mr. Buxton, who is an associate of the R.I.C. and a member of the Institute of Chemical Engineers, has been at the Bromborough works since 1947. He started his career with Lever Brothers, Port Sunlight, Limited, and worked in their Laboratory & Research & Central Technical Department. In 1934 he was appointed assistant works manager of the Company's hardening plant and remained there till 1940 when he became general works manager of the war-time Ministry of Food hardening plant at Dowlais in South Wales. When the plant closed down in 1946, Mr. Buxton went for a short while to Malaya to explore the potentialities of edible oil factories in that part of the world.

The Hanbury Memorial Medal, a gold medal given periodically for 'high excellence in the prosecution or promotion of original research in the Natural History and Chemistry of Drugs,' has been awarded to GOSTA EDMAN, Professor of Botany and Pharmacognosy at the Royal Pharmaceutical Institute, Stockholm.

The researches of Professor Edman have concerned several aspects of the study of drugs of vegetable origin. These include studies of the ash content and the presence of silica in drugs and the application of chemomicroscopical tests. His numerous microscopical studies of structure are directed towards the discovery of adulteration, and to the identification and standardisation by structural characters of crude vegetable drugs both in the unground condition and in the form of powder.

Publications & Announcements

REFRACTORIES to any shape, size, or tolerance required can be produced within 28 days from receipt of the order where moulds are available by Refractory Moulding & Castings, Ltd., Kegworth, near Derby. The complete range of its products and their applications are given in a new catalogue now available from the company on request. Methods of manufacturing refractories without the addition of clay, give the advantage of higher temperature ranges, particularly for crucible manufacture where Zircon-Zirconia is used for crucibles capable of withstanding temperatures in excess of 2,000°C. Particularly in Grades K and P, a very high resistance to thermal shock makes these refractories ideal where sudden changes of temperature are likely to be encountered.

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ENTITLED *FOSECO Foundry Practice*, a small pamphlet has been issued by Foundry Services, Ltd., of Long Acre, Nechells, Birmingham, dealing with Foseco technical service (No. 22 investigation carried out by their service personnel), an article on the control of sulphur pick-up by cupola melted iron, and news from the company.

* * *

TALL oil, both crude and refined, has been used as a reagent in flotation processes for purifying minerals ever since it became available in commercial quantities. It became important in the flotation of phosphate rock about 20 years ago and thereafter its uses extended to other minerals such as manganese ores and fluorspar. With the depletion of high-grade mineral sources, it may be expected that flotation operations will be extended more and more for separations of low-grade ores. In addition, the principles and techniques developed for the minerals industry are being taken up by other fields having the problem of low-cost, large-scale separations or classifications. The Tall Oil Association, 122 East 42d Street, New York 1, N.Y., has just issued Bulletin No. 11 which discusses in full the application of this substance to flotation processes. Aspects touched upon include flotation principles, collectors, modifiers, frothers, flotation plants, phosphate rock flotation, manganese ore flotation, iron ore flotation, and other minerals and materials.

ONE of the latest lines of Poly-Tainers (produced by Industrial Appliances, Ltd.), is a combination polythene soap box and nylon nail brush. The box is fluted and is unbreakable and the nylon brush is fitted on polystyrene to make a close fitting lid. In order to remove the brush the narrow ends of the container have merely to be squeezed together. The container is patented.

* * *

MELAMINE is now being made in commercial quantities in the United Kingdom by the British Oxygen Co., Ltd., who have published a technical bulletin (No. 1) about it. This gives a general description of melamine-formaldehyde resins, with their methods of preparation, applications and information about them. Melamine itself has other outlets, such as N-chloromelamines as antiseptics and melamine phosphates in fireproofing, and these are briefly mentioned. Also published by the company is a leaflet giving the specification for melamine made by the company and the method of analysis.

* * *

PROCESSING industrial hydrocarbons to produce a variety of products including pure hydrogen, synthesis and fuel gases is described in a brochure issued by the Power-Gas Corporation, Ltd., Stockton-on-Tees. Illustrated with diagrams and photographs the brochure explains the function of the P-G Hercules Reforming Plant to react hydro-carbons with steam or carbon dioxide or steam and carbon dioxide to produce hydrogen and carbon monoxide. The reaction is carried out with special stainless steel tubes containing a nickel catalyst at about 2,000°F. (1,100°C.), the reacting gaseous mixture reaching about 900°C. Reactions within the tubes are endothermic. The high temperature achieved results in virtually complete catalytic reforming of all the hydrocarbons to synthesis gas; for instance, hydrogen plants showing below 0.1 per cent of methane as impurity have been in production for many years. The Hercules Reforming Plant combines high thermal efficiency with a long life. Many of the alloy steel tubes used in earlier installations are in fact still in service after operating for 12 years.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

J. K. INNES & CO., LTD., Carlisle, chemical engineers, etc. (M., 6/12/52.) 31 October, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *£1,500. 4 May, 1950.

Satisfaction

WINDMILL RUBBER & CHEMICAL CO., LTD., Denton (Lancs.). (M.S., 6/12/52.) Satisfaction 31 October of debentures registered 7 January, 1948, to the extent of £1,000.

Company News

Powell Duffryn Ltd.

A dividend of 2¾ per cent (less tax) on the £3,600,000 4¼ per cent cumulative preference stock for the six months ending 31 December, 1952, is announced by Powell Duffryn Ltd. Payment will be made on 1 January, 1953, to holders registered on the books of the company at the close of business on 1 December, 1952. Transfer books will be closed for one day on 2 December, 1952.

Manchester Oil Refinery Ltd.

Payment of dividend on ordinary shares is to be deferred by the Manchester Oil Refinery, Ltd., until the full results for the year ending 31 December, 1952, are available for consideration. Increasingly difficult trading conditions are stated to be the reason for this decision. A fall in the price of lubricating oil and reduced tanker freight rates have contributed to the unsettling conditions. There has been a considerable fall in the present rates of profits and the board states that it has not proved practicable to raise additional permanent capital as envisaged in the last annual report. The new construction programme is proceeding satisfactorily and should be completed early next year.

Changes of Address

The Tudor Accumulator Co., Ltd., of Dukinfield, Cheshire, announces that the company's London office has now been removed to 137 Victoria Street, London, S.W.1. The telephone number and telegraphic address are: TATe Gallery 0307 and Subconical, Sowest, London, respectively.

The London office of Pritchard & Gold and E.P.S. Co., Ltd., the battery makers, of Dagenham Dock, Essex, has been moved to 137 Victoria Street, London, S.W.1. The telephone number and telegraphic address are: TATe Gallery 9212 and Storage, Sowest, London, respectively.

MR. H. HEPWORTH, of the Pharmaceutical Division, Imperial Chemical Industries, Ltd., London, arrived at Liverpool on 22 November in the liner Media, following a visit to the U.S.A. to obtain orders for new British drugs. I.C.I., said Mr. Hepworth, had a number of drugs which had not yet been released in the U.K., but orders were being taken in America. There had been some falling off in the drug trade in the U.S.A., but there were now signs of improvement.

The Board of Trade has anounced that they are open to receive applications for licenses to import cork, cork manufactures, dipentene and turpentine from certain countries other than Scheduled Territories during the period 1 January to 30 June, 1953. Licenses for cork, cork manufactures, and dipentene will be related to importers' trade but applications to import turpentine will be considered individually. Full details of the procedure for applying for import licences can be obtained from the Import Licensing Branch, Board of Trade, Romney House, Tufton Street, London, S.W.1.

Next Week's Events

MONDAY 8 DECEMBER

Royal Institute of Chemistry

London: County Technical College, Dartford, 7.30 p.m. Film and lecture. Dr. J. G. A. Griffiths: 'Rockets and Chemistry.'

Society of Chemical Industry

Sheffield: Brown-Firth Research Laboratories, Princess Street, 3.15 p.m. Exhibition of films; Grand Hotel, Leopold Street, 6.45 p.m. Joint meeting of the Corrosion Group and the Yorkshire Section SCI, with the Sheffield Metallurgical Association. Dr. U. R. Evans: 'The Corrosion Resistance of Stainless Steels.'

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. Dr. C. F. Flint (Factice Research and Development Association): 'The Application of Factice to the Proofing Industry.'

Incorporated Plant Engineers

Dundee: Mathers Hotel, 7.30 p.m. T. C. Robinson: 'Maintenance Organisation—the American and British Approach Compared.'

TUESDAY 9 DECEMBER

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. J. L. Edgar: 'The Use of Sulphuric Acid in a Totally Enclosed System.'

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Plastics and Polymer Group. M. F. Vaughan (Distillers Co. Ltd.): 'The Bulk Polymerisation of Styrene'; Dr. P. A. Small (I.C.I. Ltd., Plastics Division): 'Methyl Methacrylate Polymerisation'; followed by discussion.

Sheffield: Corrosion Group. Visit to Firth-Brown works; assemble main offices, Savile Street, 10 a.m. Lunch will be provided at 12 noon.

Hull Chemical & Engineering Society

Hull: New York Hotel. Annual dinner.

Chadwick Public Lectures

London: Wright-Fleming Institute, St. Mary's Hospital Medical School, Norfolk Place, Paddington, W., 4.30 p.m. Dr. A. I. G. MacLaughlin (H.M. Medical Inspector of Factories): Malcolm Morris Memorial Lecture, 'The Prevention of Dust Diseases of the Lungs.'

Textile Institute

Bolton: Municipal Technical College, 7.30 p.m. W. A. Opie: Examination and Testing of Textiles by Chemical Methods.'

WEDNESDAY 10 DECEMBER

Society of Chemical Industry

Birmingham: Mason Theatre, the University, Edmund Street, 6.30 p.m. G. R. Perdue: 'Synthetic Detergents in Commercial and Domestic Use.'

London: Burlington House, Piccadilly, W.1, 6.15 p.m. Nutrition Panel of the Food Group. 'Food and the Future,' first of a series of four meetings. F. le Gros Clark and Dr. E. W. Russell: '1. The Problem of Future World Food Supply.'

Institute of Fuel

Manchester: Engineers' Club, Albert Square, 10 a.m. One-day conference: 'A Special Study of Ash and Clinker in Industry.'

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. General discussion: 'Unusual Metal Failures.'

THURSDAY 11 DECEMBER

The Chemical Society

Hull: University College, 7.30 p.m. Joint meeting with the RIC and the University College Scientific Society. Dr. R. Spence: 'Chemical Research at Harwell.'

Royal Institute of Chemistry

London: Acton Technical College, High Street, W.3, 7.30 p.m. Mr. J. E. Page: 'Some Recent Developments in Physical Methods of Chemical Analysis.'

Society of Chemical Industry

Edinburgh: North British Station Hotel, 7.30 p.m. D. Traill: 'Adventures in Synthetic Fibres.'

The Royal Institution

London: 21 Albermarle Street, W.1, 5.15 p.m. Last of course of four lectures. Dr. D. H. R. Barton (Reader in Organic Chemistry, Birkbeck College, University of London): 'The Chemistry of the Steroids.'

Society of Public Analysts

Glasgow: University, 7.15 p.m. Scottish Section. Dr. G. T. Mills: 'Electrophoresis.'

London: Burlington House, Piccadilly, W.1, 6.15 p.m. Eighth annual general meeting of the Biological Methods Group, followed by ordinary meeting. Speakers will include: Dr. Raymond Greene, K. A. Lees, Miss J. Vaughan Morgan and J. P. R. Toothill.

FRIDAY 12 DECEMBER

Society of Chemical Industry

London: King's College, Strand, W.C.2, 7 p.m. Fine Chemicals Group. E. L. Streatfield (Filtrators Ltd.): 'Ion Exchange and its Applications in the Fine Chemical Industry.'

Institution of Chemical Engineers

London: Caxton Hall, Westminster, S.W.1, 6.30 p.m. Graduates' and Students' Section. Dr. C. R. Black: 'The Production of Chlorine.'

Oil & Colour Chemists' Association

Manchester: Grand Hotel, 6.30 p.m. F. Schollick: 'Some Aspects of the Evaluation and Use of Amine Resins.'

London: London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, Post Graduate Lectures. Dr. C. E. H. Bawn: 'Autoxidative Reactions: their Chemistry, Mechanism and Catalysis by Metal Salts.'

Institute of Metal Finishing

Sheffield: Grand Hotel, 6.30 p.m. Sheffield and North East Branch, joint meeting with the Institute of Metals. Dr. G. L. J. Bailey: 'The Mechanism of Adhesion of Electrodeposits upon Aluminium.'

SATURDAY 13 DECEMBER

Institution of Chemical Engineers

Liverpool: Stork Hotel, 2.30 p.m. North Western Branch joint meeting with SCI. G. J. Lewis: 'Recent Developments in the Technique of Making Fused Caustic Soda.'

British Association of Chemists

London: Waldorf Hotel, 3 p.m. 35th annual general meeting. The chair will be taken by the president, Mr. R. P. Porter.

Market Reports

LONDON.—The demand for industrial chemicals is perhaps a little better compared with the past few months' trading, and deliveries against contracts are being called for with fair regularity. Export business has shown no decided trend and there is a moderate volume of overseas inquiry in circulation at competitive levels.

Price movements have been few and makers' quotations generally are unchanged although a number of pharmaceuticals and fine chemicals, such as theophylline, amidopyrine, and the bromides are lower. With the fluctuations in the price of the metal, the prices of the lead compounds have moved within narrow limits. The quotations on 29 November for dry white lead being £141 per ton and for dry red lead and litharge £125 5s. per ton.

Pitch is again one of the few active items in the coal tar products market with creosote oil and carbolic acid also enjoying a steady buying interest. The demand for cresylic acid remains slow.

MANCHESTER.—A reasonably steady demand against contracts has been reported on the Manchester chemical market during the past week, including a slight improvement in takings by the textile bleaching, dyeing, and finishing trades, and the movement on export account has also been maintained fairly well. So far as new business is concerned, however, most buyers are still pursuing a cautious policy and this is likely to continue until after the turn of the year. In the aggregate a moderate business is reported in the market for fertiliser materials, and tar products.

Obituary

Mr. E. B. Read

We regret to announce the death of the chairman of Reads Limited, MR. ERIC BRADBURN READ, of Little Paddock, Christleton, near Chester.

Mr. Read was born in 1899, and was educated at the Leas School, Hoylake, and subsequently at Marlborough College. He was called up towards the end of World War I., and served as a captain in the Royal Artillery. Shortly after he left the Army he joined Reads Limited, the tin box and drum manufacturers, founded by his grandfather, Mr. Robert Read, in 1869. Following on the retirement of the late Mr. John W. Mann in 1942, he became chairman of the company, which position he occupied until his last illness. He died in Ruthin Castle Sanatorium on Wednesday 26 November, and his funeral was at Christleton Parish Church on Saturday 29 November.

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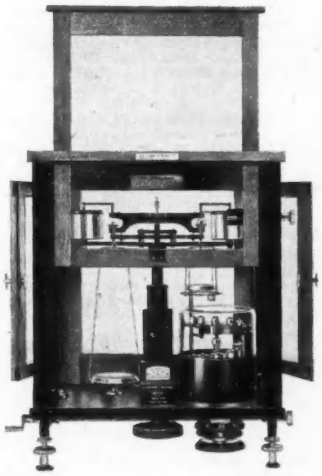

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A VACANCY occurs on the Editorial Staff of **THE CHEMICAL AGE** for a **SUB-EDITOR-REPORTER** who has had some experience in Chemical Engineering or Industrial Chemistry. Shorthand desirable but not essential. Applications, in writing, stating full details of experience, and salary expected, to the **MANAGING DIRECTOR, "THE CHEMICAL AGE," 154, FLEET STREET, LONDON, E.C.4.**

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9	7′ 0″	30′ 0″	7,500
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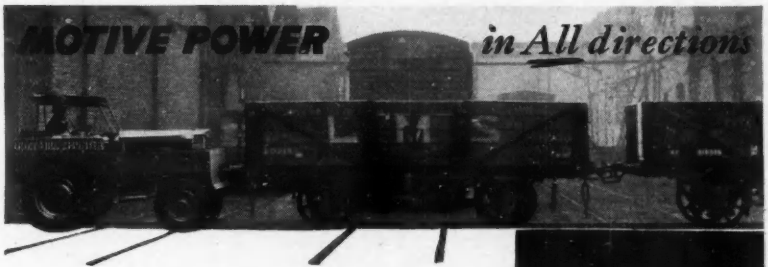

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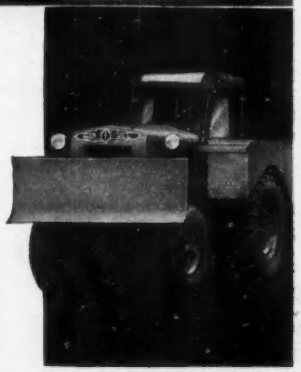

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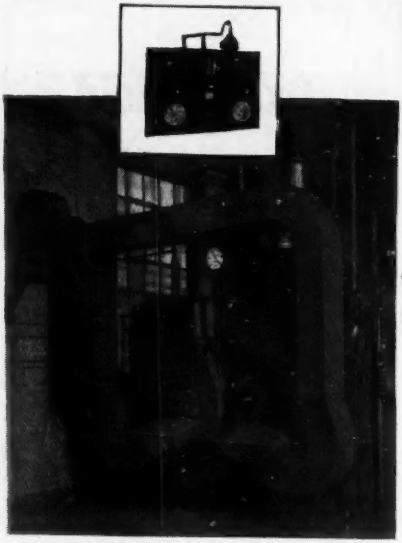

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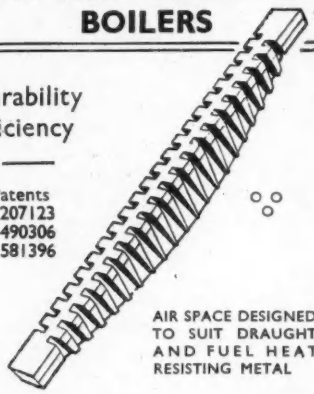

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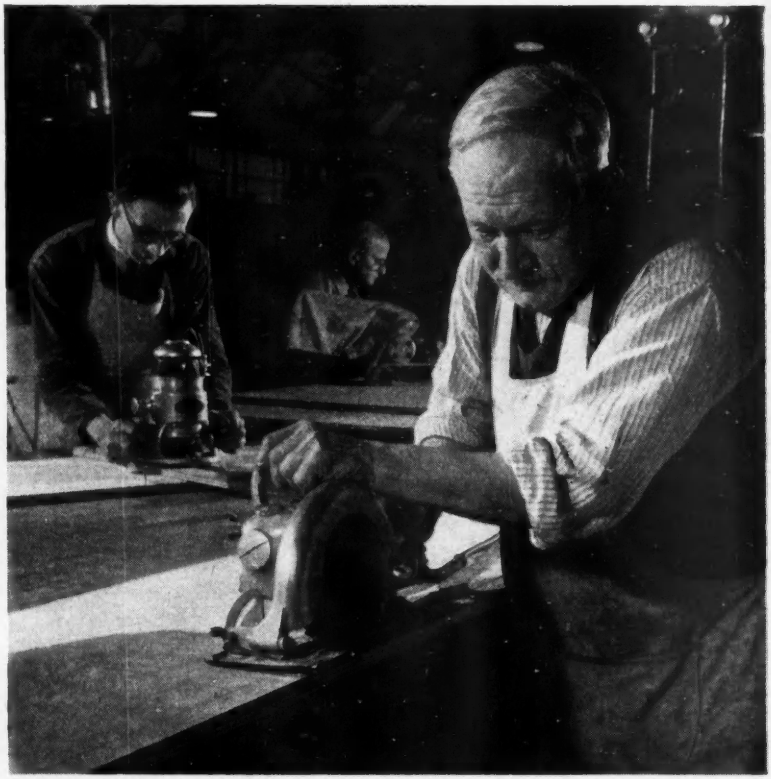

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